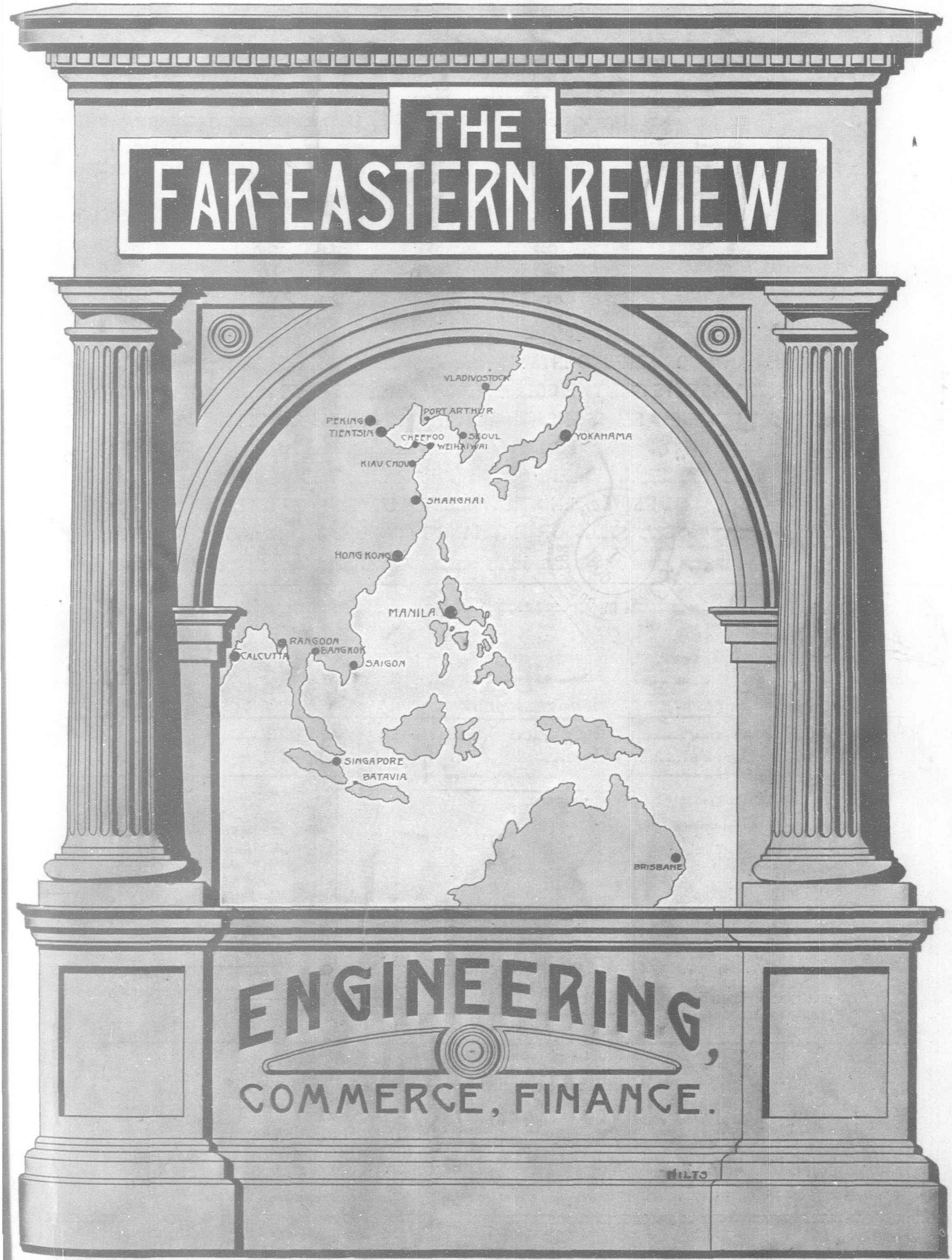
China, Manchuria, Japan, Indo-China, Siam, Straits Settlements, Malay States, Burma, India, Malaysia, and the Philippines

This issue contains an illustrated article on the Peking and Hankow Railway

VOL. III: No. 5. MANILA, SHANGHAI AND YOKOHAMA, OCTOBER, 1906 25 cents, U. S. Cy. 50 „ Philippine Cy.

THE FAR-EASTERN REVIEW

ENGINEERING, COMMERCE, FINANCE.



FOR SALE by all book stores in Manila and Shanghai, and by KELLY & WALSH, Hongkong, Shanghai, Singapore, and Yokohama;
TIENTSIN PRESS, Tientsin; PROBSTHAIN & CO. (Oriental Booksellers and Publishers), 14 Bury-st,
British Museum, London (W. C.); BRENTANO'S, Washington, D. C.

46647

INTERNATIONAL BANKING CORPORATION

HEAD OFFICE, 60 WALL STREET, NEW YORK

LONDON OFFICE, THREADNEEDLE HOUSE, BISHOPSGATE STREET, WITHIN, E. C.

CAPITAL PAID UP AND SURPLUS, $6,643,686.99, UNITED STATES CURRENCY

THOMAS H. HUBBARD, President
JAMES S. FEARON, Vice-President

JOHN B. LEE, General Manager
ALEXANDER & GREEN, Counsel

BRANCHES

Bombay
Calcutta
Canton
Cebu
City of Mexico
HongKong
Kobe
Manila
Panama
Penang
San Francisco
Shanghai
Singapore
Washington, D. C.
Yokohama

AGENCIES AND CORRESPONDENTS IN ALL PRINCIPAL CITIES OF THE WORLD
FISCAL AGENTS FOR THE COLLECTION OF THE CHINESE INDEMNITY
FISCAL AGENTS FOR THE UNITED STATES IN CHINA, THE PHILIPPINE ISLANDS AND THE REPUBLIC OF PANAMA
DESIGNATED DEPOSITORY FOR THE FUNDS OF THE GOVERNMENT OF THE PHILIPPINE ISLANDS
GENERAL FOREIGN BUSINESS TRANSACTED
ISSUE COMMERCIAL AND TRAVELLERS' LETTERS OF CREDIT
BUY AND SELL BILLS OF EXCHANGE AND CABLE TRANSFERS

Hongkong and Shanghai Banking Corporation

DEPOSITORY OF THE GOVERNMENT OF THE PHILIPPINE ISLANDS

Capital (Paid in Cash)............ $10,000,000
Sterling Reserve Fund........ $10,000,000
Silver Reserve Fund............ $10,250,000
Reserve Liability of Prop'rs. $10,000,000

COURT OF DIRECTORS:

A. HAUPT, Esq., Chairman.
G. H. MEDHURST, Esq., Deputy Chairman
E. GOETZ, Esq.
Hon. Mr. W. J. GRESSON
C. R. LENZMANN, Esq.
D. M. NISSIM, Esq.
A. J. RAYMOND, Esq.
R. SHEWAN, Esq.
N. A. SIEBS, Esq.
G. BALLOCH, Esq
H. E. TOMKINS, Esq.

Head Office, Hongkong and Shanghai Banking Corporation, Hongkong.

BRANCHES AND AGENCIES:

Hongkong
Shanghai
Yokohama
London
Bombay
Calcutta
Foochow
Kobe
Saigon
Hankow
Amoy
Manila
San Francisco
New York
Singapore
Lyons
Tientsin
Pekin
Iloilo
Penang
Batavia
Bangkok
Hamburg
Nagasaki
Rangoon
Colombo
Sourabaya

CORRESPONDENTS—In Samar and Leyte: WARNER, BARNES & CO., LTD.
CORRESPONDENTS—In Cebu: KER & CO.
LONDON OFFICE—31 Lombard St.
LONDON BANKERS—London & County Banking Co., Ltd.

Interest Allowed on Fixed Deposits at Rates which may be Learned on Application. Credits Granted on Approved Securities, and Every Description of Banking and Exchange Business Transacted. Drafts Granted on London and the Chief Commercial Places in Europe, India, Australia, America, China and Japan.

J. R. M. SMITH, Chief-Manager - - - HONGKONG ~ A. G. STEPHEN, Acting Manager - - - MANILA

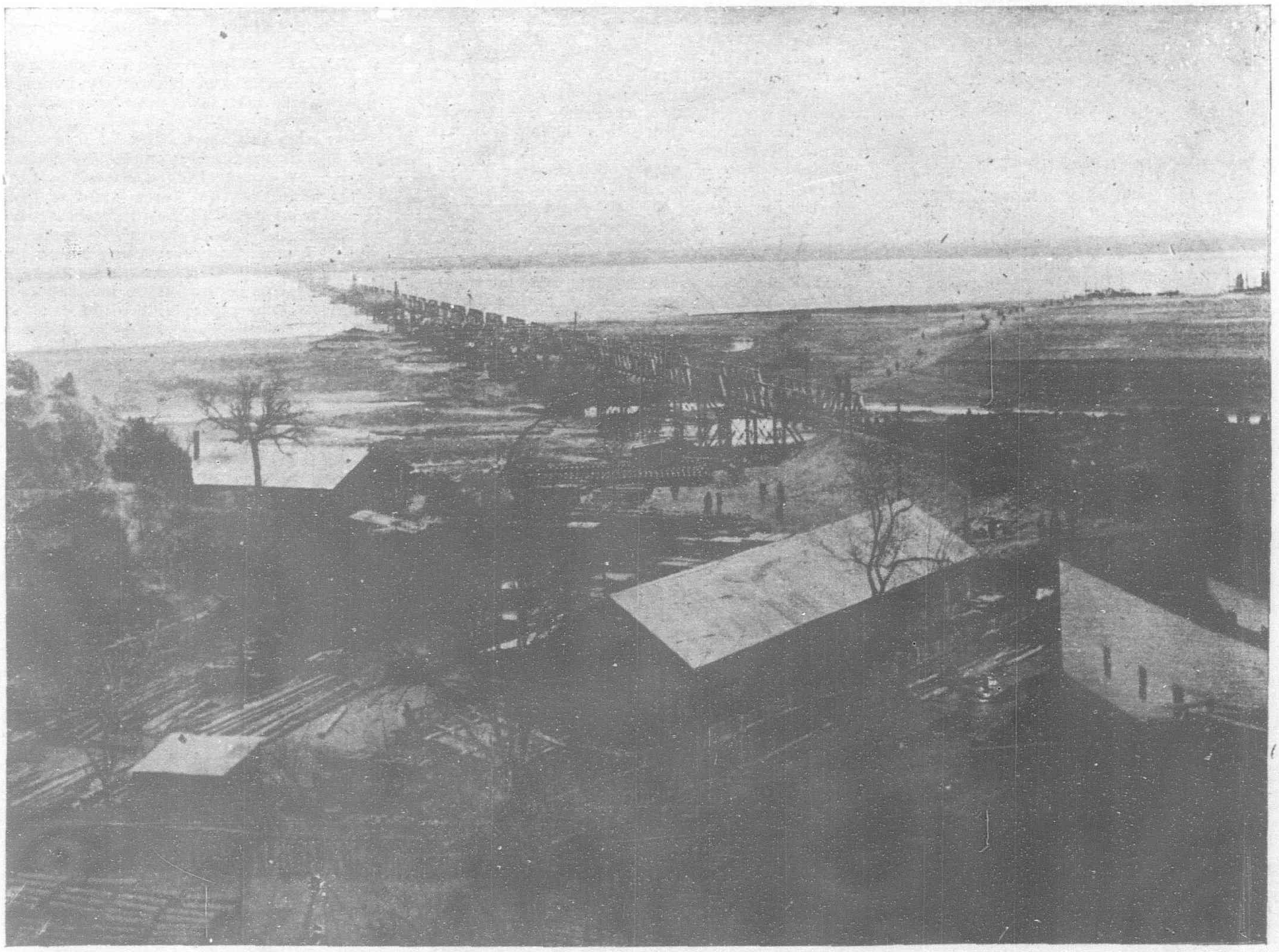
WADE GARDNER, Agent, 50 Wall Street, New York.
W. H. HARRIES, Agent, 401 Montgomery Street, San Francisco

THE FAR EASTERN REVIEW
COMMERCE ✪ ENGINEERING ✪ FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, OCTOBER, 1906. No. 5.

CONSTRUCTION OF THE PEKING AND HANKOW RAILWAY BY THE FRANCO-BELGIAN SYNDICATE

Of all the enterprises in China in which Belgian capital has taken a share, the most important is certainly the Peking-Hankow (Lu-Han) Railroad.



GREAT STEEL BRIDGE ACROSS THE HWANG-HO, OR YELLOW RIVER

This immense line is 1,200 kilometers long and constitutes, with its future extension from Hankow to Canton, the Great Central Railway of China, which will one day form the trunk line of all the other railroads of Central China, and which will link the Gulf of Pechili with the Gulf of Tong-King—2,500 kilometers—passing through Hankow, the largest port of the Yangtsze Blue River, which is situated at the junction of this waterway and the Han River.

The Hankow-Wuchang-Hanyang agglomeration—the knot of the entire Chinese system of railroads—had formerly 6,000,000 inhabitants, but there remain now no more than 2,000,000 since the terrible Taiping Rebellion which desolated this region. Owing to her unique location on one of the finest rivers of the world, in the center of a valley with a population of 100,000,000 people, nothing, however, should prevent Hankow from returning to her ancient importance as a trade center. The same may be said of other cities as railroads replace the almost extinct imperial highways and the obstructed canals.

On the N., the Great Central Railway of China will connect, *via* the Imperial Railways of North China, with the Manchurian and Transsiberian systems; on the S., by means of the Lan-son and projected Nanning lines, with the French Indo-China system. The idea of a railway traversing all the provinces of Central China had, since sometime ago, been the essential subject of all China theories concerning railroads.

PROJECT FORMULATED.—In 1889, Chang-Chih-Tung, then Governor of Canton, formulated a clear project in a report to the emperor at Peking. His proposals were considered as most valuable and an imperial decree sent Chang to the viceroyalty of the Two Hus, of which the capital (Wuchang) and Hankow face each other on opposite sides of the Yangtsze. His special mission was to preside over the construction of the southern portion of the Peking-Hankow line, while Li-Hung-

(Continued on page 146)

THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.
PUBLISHER AND EDITOR

COMMERCE :-: ENGINEERING :-: FINANCE

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in the Philippines and Far Eastern Countries

PUBLICATION OFFICE:
MANILA, PHILIPPINE ISLANDS

ROBERT B. WESTCOTT
Associate Editor

A. R. TUOHY
Business Manager

CHINA OFFICE:
10 Peking Road, Shanghai
ROYAL P. LOWREY
Manager

JAPAN OFFICE:
20, Bund, Yokohama
E. W. MILLS
Manager

GREAT BRITAIN:
PROBSTHAIN & CO.
14 Bury Street, British Museum, London, W. C.

SUBSCRIPTION AGENTS:

HONGKONG..............	KELLY & WALSH, LTD.
SINGAPORE..............	" " " "
YOKOHAMA..............	" " " "
SHANGHAI..............	" " " "
KOBE..............	J. L. THOMPSON CO.
NAGASAKI..............	F. H. HUNT.
TIENTSIN..............	TIENTSIN PRESS, LTD.
WASHINGTON, D. C.....	BRENTANO'S.

SUBSCRIPTION RATES: Philippines, United States, Canada, and Mexico, $2.50 U. S. C. per year. To all other countries in the Postal Union, $3.00 per year. Single copies 25 cents, U. S. C.

ADVERTISING RATES will be mailed on application.

ENTERED AT POST OFFICE, MANILA, P. I., AS SECOND CLASS MATTER.

MANILA, SHANGHAI AND YOKOHAMA, OCTOBER 1906

CONTENTS

PAGE

Construction of the Peking and Henkow Railway, etc. (illustrated) 143

EDITORIAL:

Hongkong's Meteorological Service.............. 144
Hon. W. Morgan Shuster (illustrated)........... ,,
Trade of Shanghai, 1905......................... ,,
Cigar-Box Industry .... ,,
Yunnan Railway.................................. 145
New Garden Bridge, Shanghai..................... ,,

Destruction of Shipping and Dock Property at Hongkong (illustrated)........................ 150
Some Interesting Drainage Problems of Oriental Cities (illustrated)........................ 152
Bids on Locomotives, Bangkok.................... 157
Public Works Program for 1907, Hongkong..... ,,
Philippine Contracts............................ ,,
Some Philippine Fibers and Fibrous Substances, etc. (illustrated)......................... 158
Remarkable Steamship Record..................... 163
Important Shipbuilding Contracts................ ,,
Javanese for Indo-China......................... ,,
Philippine Miners Organize...................... ,,
"The Commercial Orient in 1905"................. 164
Philippine Timber Industry...................... ,,
Manila Railway Company, Ltd..................... 165
Railway Construction in the Federated Malay States (illustrated) 166
Public Works, Straits Settlements................ 167
New Railway, British North Borneo............ ,,
Annual Report of the Straits Settlements..... ,,
Mancayan-Suyoc Mines and River Placers, etc. 168
Yangtsze River Steamer *Loong-Wo* (illustrated) 171
"Interesting Manila"............................ ,,
"Purifine"...................................... ,,
Far Eastern Engineering, Construction, Commercial and Financial News................ 172

HONGKONG'S METEOROLOGICAL SERVICE.

Anent the destructive typhoon which recently visited Hongkong, the newspapers of that colony have been discussing with more or less vehemence its meteorological service. Failure by the observatory to give timely warning of the approaching storm to shipping and other harbor interests, has resulted in charges of gross negligence against Director W. Doberck, with the result that the Governor of Hongkong feels himself called upon, in the interest of the colony, to institute a searching investigation into the conduct of the observatory. During all the controversy, in which the observatory management seems to appear in a most unenviable light, it should be a matter of self-congratulation for the Philippine Government and the reverend director of the local Weather Bureau, that the Manila Observatory and its management come in for high praise from the seat of the trouble. And while we have no desire to take part in the discussion, we deeply regret the final decision of the Rev. José Algué, S. J., Director of the Philippine Weather Bureau, not to publish an extensive report of the typhoon in his official bulletin for September. The identity of this storm with the one which crossed the Philippines a few days earlier, may be pointed out by Father Algué; but in view of the animosity which has always been displayed by Mr. Doberck against the Manila Observatory, and his antagonistic attitude thereto, the reverend director has no desire to embitter him still more by pointing out what might have been done in line of timely forewarning of the Hongkong disaster. Furthermore, a thorough discussion of the subject could not be accomplished at the Manila Observatory without access to Mr. Doberck's records, which privilege Father Algué might not hope to be accorded on account of the one-sided animosity which restrains professional and scientific freedom of communication between the two institutions. We should like to see the barrier of jealousy so long existing torn away, because we believe that with earnest and unselfish coöperation between the observatories of Manila and Hongkong much good could be accomplished in the public interest.

HON. W. MORGAN SHUSTER

Mr. W. Morgan Shuster (see illustration on page 167) has taken his seat as a member of the United States Philippine Commission, under appointment by President Roosevelt, and has entered upon his cabinet duties as Secretary of Public Instruction. In the promotion of Mr. Shuster from the office of Insular Collector of Customs, the faithful and efficient services of a highly esteemed servant of the Government have been rewarded. At the head of the Bureau of Customs, Mr. Shuster discharged his onerous duties with signal ability, and although he was repeatedly criticized for his strict and impartial construction of the customs laws, at no time was it ever hinted at that he lacked integrity or honesty. During his official career in the Philippines he has made himself beloved by the Filipinos, to the extent that when he announced to his native friends his candidacy for a seat on the Commission they rallied to his support to a man. To this friendship, so wisely cultivated for several years, Mr. Shuster owes his promotion in large degree.

The commissioner begins his new duties with the hearty good will and earnest support of all classes and nationalities. This fact was clearly demonstrated at a popular banquet given in Manila, on the evening of October 12th, in his honor, which was one of the largest and most cosmopolitan entertainment of its kind since American occupation. The trend of the addresses on that occasion was deep concern for the commercial, industrial and agricultural rejuvenation of the Philippines; and Mr. Shuster's remarks along these lines were vigorous, pointed, and sincere. Being by several years the youngest member of the Commission, we expect from him like vigorous and sincere work in the department he now conducts. The merchants of Manila, in particular, are to be congratulated on his appointment because we believe that in Mr. Shuster they have another aggressive Commissioner who will make their interests his special concern. We congratulate both Mr. Shuster and the business interests on his promotion. We believe his career as Commissioner will be far more brilliant than his administration of the customs, if the enthusiasm of young manhood and a brilliant, well-trained mind count for anything.

TRADE OF SHANGHAI, 1905.

According to a report emanating from the British China Consular Service, recently published, the gross trade of the Port of Shanghai during 1905 amounted to £66,795,116 as against £58,008,150 in 1904 and £44,237,049 in 1901. The net value of trade, *i. e.*, foreign and native imports, less re-exports, and native exports of local origin, was £26,619,440 in 1905 as against £20,444,328 in 1904 and £17,567,351 in 1901. The total import, including re-exports, of foreign goods; and the total exports, including re-exports, of native produce to foreign countries were £55,101,652 as against £46,562,745 in 1904 and £35,549,834 in 1901.

The year under review was an exceptional one, the trade and general conditions of the port having been influenced by several unusual causes, such as the boycott, the typhoon of September 1st which caused a loss of millions of dollars to heavy stocks in godowns or warehouses; and absence of trade in the north on account of the Russo-Japanese War, etc. In spite of these adverse influences, the trade of Shanghai shows a healthy increase over that of 1904, and everything seems to point to an ever-increasing prosperity there. With the exception of 1903, there has been a steady increase since 1901; and to go back 10 yrs., the figures of 1905 are about double those of 1895. The marked and continued increase in the trade of the port shown by these figures speaks volumes for the commercial prosperity of Shanghai, and indeed the whole of China, for the trade of Shanghai is chiefly that of a re-distributing center for imports and a port of re-shipment for exports.

The imports of metals of various kinds also shows an increase in copper, iron and steel of all sorts, especially in galvanized-iron sheeting. Lead alone shows a falling off. The import of copper ingots was 205,749 cwts. as against 61,397 in 1904; iron and steel angles, nail rods, etc., nails, sheets and plates, galvanized iron sheets and plates, pig and bar lead, and zinc, 412,052 cwts. as against 139,901 in 1904. The import of hardware amounted to £38,211 as against £22,883 in 1904; of machinery, to £96,498 as against £85,422; of kerosene, to 35,489,571 galls. as against 28,912,554; of engine oil, 938,909 galls. as against 182,559; of hard timber, 1,032,724 cu. ft. (decrease) as against 1,189 917; of soft timber, 19,489,186 sq. ft (decrease) as against 23,784,216 in 1904.

Ten thousand, two hundred sixty-five vessel representing a total tonnage of 14,344,162 entered and cleared the Port of Shanghai during 1905 as compared with 9,434 vessels with a total tounage of 12,181,798 in 1904. Of the figures for 1905, 9,139 vessels (14,125,919 tons) were steamers and 1,126 (218,243 tons) sailing ships. Of the former the British led the list with 4,363 (7,114,248 tons), and next in order came Chinese, German and Norwegian vessels.

CIGAR-BOX INDUSTRY

In a recent communication to the Secretary of the Interior of the Government of the Philippine Islands, Major George P. Ahern, U. S. Army, Director of Forestry, makes public some interesting facts covering discrimination against the local cigar-box industry in favor of European manufacturers.

European cigar-box makers send to Cuba and Central America for cedar, which is shipped in the log and sold in Europe, including freight; duties, etc., at 220 to 250 francs per cu. met., which is about ₱2.37 to ₱2.70 Philippine currency, per English cu. ft. This material is worked up into boards, ready to put together into cigar-boxes, at approximately the following prices per 100 boxes:—₱6.38, ₱6.51 and ₱ 7.41, according to size of boxes. These are prices quoted to a former forester of Major Ahern's bureau, who was in Europe at the time the figures were given.

To the large importers a lower figure is quoted. A single shipment of 47,500 cigar boxes was received from Germany this year by a Manila cigar factory. The invoice gave the following figures:—

47,500 cigar-boxes (average cost per 100 boxes, ₱5.80)	₱2,799.67
Freight to Manila	304.48
Insurance	20.74
Commission	78.08
Unloading at Manila	60.15
Import duties (at ₱1.50 per c. m.; present Government charge on Philippine cedar, *calantas*, in Cagayan, Mindoro and Moro provinces)	34.54
Brokerage	61.23
Total	₱3,358.89
Average cost per 100 boxes	₱ 7.07
Cost of putting boxes together	1.00
Total cost per 100 boxes	₱ 8.07

The Philippine wood known as *calantas* makes a good cigar-box wood and it should be used to the exclusion of Cuban or Central America cedar. It seems strange that Cuban cedar can be carried to Germany and sold there at from ₱2.37 to ₱2.70 per English cu. ft., then made up into boxes, shipped to Manila, paying freight, duties, insurance, brokerage and lighterage, and sold cheaper than cigar boxes made in Manila of practically the same wood. The import duties form a small item in the cost, but that sum is exactly the full Government charge on *calantas*. The Manila price of *calantas* is approximately ₱0.90 per English cu. ft., much less than half the cost of the Cuban cedar in Germany.

Calantas is usually brought from Cagayan, Mindoro and Moro, although it is found in many other provinces. The price for *calantas* has not changed to any extent during the past 4 or 5 yrs. It remains at about ₱0.70 per Spanish cu. ft., or about ₱0.90 per English cu. ft. Although the Government charge on this wood was reduced in May, 1904, from 14 to 5½ *centavos* per Spanish cu. ft., in the above-named provinces, the market price was not affected. The men in the woods and the consumer received no benefit from the reduction. The cost of getting a cubic foot (Spanish) of *calantas* from the Cagayan Valley to Manila is about as follows:—

Cutting and hauling to water	₱ 0.15
Transportation to ship	0.04
Freight to Manila	0.30
Government charges	0.05½
Unloading	0.02
Total	₱ 0.56½

Dealers in Manila sell the wood in the log, as heretofore stated, for about ₱0.70 per Spanish cu. ft., or ₱0.90 per English cu. ft. The lumber is sold at about ₱180 per 1,000 b. m. A few of the Manila sawmill men have made cigar boxes—Barretto & Co., Tuason and Sampedro—and sell them from ₱11 to ₱15 per 100. The German factories turn them out at a profit for ₱5.80 per 100. Barretto & Co., Manila, find that the business is not remunerative at ₱11 to ₱15, and are not making any more boxes.

The difficulty lies in the method of manufacture. Skilled labor may be obtained in Manila at a comparatively low wage. The Filipinos are very apt in learning how to handle new machines. With modern cigar-box machinery in Manila boxes should be turned out at the lowest figure above quoted, or approximately ₱6 per 100.

A petition from the municipal presidents in the Province of Cagayan requests that *calantas* be taken from the second group and placed in the third group, thereby reducing the Government charges on this wood about ₱0.01½ per cu. ft. However, if the reduction from 14 to 5½ *centavos*, made in May, 1904, made no change in the market price of *calantas* nor in the quantity of timber delivered in Manila, it is probable that a further reduction of ₱0.01½ will fail to bring about the results desired by the municipal presidents. In Spanish times, *calantas* was placed in the first group and a charge of 5 *centavos* per cu. ft. imposed on such wood coming from Cagayan and Mindoro. In May, 1904, at the solicitation of a number of people, this wood was placed in the second group by the Director of Forestry, yet, as stated before, the market price of the wood in the log and manufactured into lumber remained the same.

In order to foster, therefore, the cigar-box industry, in the event that modern machines are introduced, Major Ahern recommends that the Government charges on *calantas* used for such purposes be not imposed for 5 yrs. Without the introduction of modern machines, a reduction of ₱0.01½ per cu. ft. would not of itself revive the industry.

Some statistics have been secured from the Bureau of Internal Revenue which show about the number of cigar-boxes consumed in the Philippines *per annum* and give a good idea of what could be accomplished in the cigar-box industry were it to be revived on a basis where it could compete with the foreign factories. They follow:—

Cigars manufactured in the Philippine Islands during the fiscal year ended June 30th, 1906:—

Consumed in the Philippine Islands	80,000,000
Exported (of which about 40,000,000 were very small cigars used in the China trade)	94,341,542
Total	174,341,542
	40,000,000
	134,341,542
Many cigars are sold in bundles and not boxed, say	14,341,542
Total number of cigars boxed about	120,000,000

Averaging 40 cigars to a box, 3,000,000 boxes would be required, according to these figures.

A very small number of boxes are made in Manila and a very large number of boxes are used more than once by the Chinese.

About 1,500,000 boxes are imported from Europe each year.

Twenty-one hundred boxes require 1 cu. met. of boards in their manufacture, 2,100,000 boxes require 1,000 cu. met. of boards, or 35,000 cu. ft., or 420,000′ b. m. This could be secured from 50,000 cu. ft. in the log if sawed economically. A tree 30″ in diameter with 50′ clear length, should furnish over 2,000′ b. m. Two hundred and ten such trees would supply material enough for more than 2,000,000 boxes. Seven thousand boxes per day for 360 days would be required to supply such a demand.

We believe that Major Ahern's conclusions should prompt local capital, with his assistance, to establish a modern cigar-box manufactory in Manila and thus keep all the benefits accruing from the industry at home.

YUNNAN RAILWAY

An account has been received from H. B. M. Consul at Hanoi (Mr. T. Ff. Carlisle) of a journey recently made by him from Hanoi to Yunnan-fu. The railway from Yenbay to Laokay was opened to public traffic on Feb. 1st last, putting thereby the frontier of Yunnan into railway communication with Haiphong. After reaching Laokay, Mr. Carlisle proceeded along the Nam Ti Valley to Mengtsze, which is the course followed by the Indo-Chinese railway, and continued along the route of the Railway to Yunnan-fu. On his return he took the route *via* Manhao and the Red River, which has been the usual route for travellers between Tong-King and Yunnan. This, he says, will doubtless be gradually abandoned in favour of the Nam Ti Route as the railway advances along the latter. Mr. Carlisle makes the following general observations on his journey:—

The consensus of opinion seems to be that the line will probably be completed for traffic in three or four years. When it is opened I fully anticipate that it will carry a considerable import into Yunnan of goods from Hongkong. Foreign goods in transit through Tong-King have to pay only 20 per cent. of the French General Tariff. In addition to this they would have to pay, of course, the Chinese import duties. But even granting that the districts of Yunnan lying south of the capital receive the bulk of their foreign imports by way of the railway, will such trade be sufficient to make the latter pay in view of what it will have cost by the time it is finished? Local French opinion seems now to doubt it, and to hold that railway connection between Yunnan-fu and Szechuan will have to be provided somehow to give sufficient traffic to the Haiphong-Yunnan-fu line. If one regarded the actual course of the railway line, one would have little hesitation in coming to this conclusion also. The portion from Laokay to Mengtsze (164 kilometers) contains no promise of future trade whatever. From Mengtsze northwards the prospect is considerably brighter. But still a great part of the course of the railway lies through unproductive country, such as the narrow valleys and gorges of the Boi Ta Ho. . . . . Had I left Yunnan having seen only the course of line, I should, have gone away with the impression that it was a country too poor to make it worth while to build railways in it. But my return journey by the route on the west of the *trace* showed me that there was a considerable population there within easy reach of the line, and I understand that there is a similar belt on the east. Between these two regions and with the country immediately on its route, together with the more remote parts of the province, which are sure to contribute a certain amount of traffic in time, there should be enough business for the railway, provided that the French Custom House and railway officials do not hamper traffic with heavy duties and freights and vexatious regulations. I still do not regard Yunnan as a rich country, but, of course, I have only seen a portion of it. I believe that Monsieur Lantenois, "Chef de Service des Mines" in the Public Works Department of Indo-China, has expressed an opinion unfavorable to the idea of the great value of Yunnanese mines. (The tin of Ko Chiu is, of course, a valuable asset.) Whether or not there is enough wealth in the province to make the Yunnan Railway a financial success, I have no doubt that there is enough to purchase a considerable quantity of foreign goods when they can be brought up by train in two or three days' journey from Haiphong instead of having to submit to the cost and risks of the long voyage overland or by the Red River. I make no doubt, too, that a large proportion of the goods will be of British origin and imported from Hongkong.

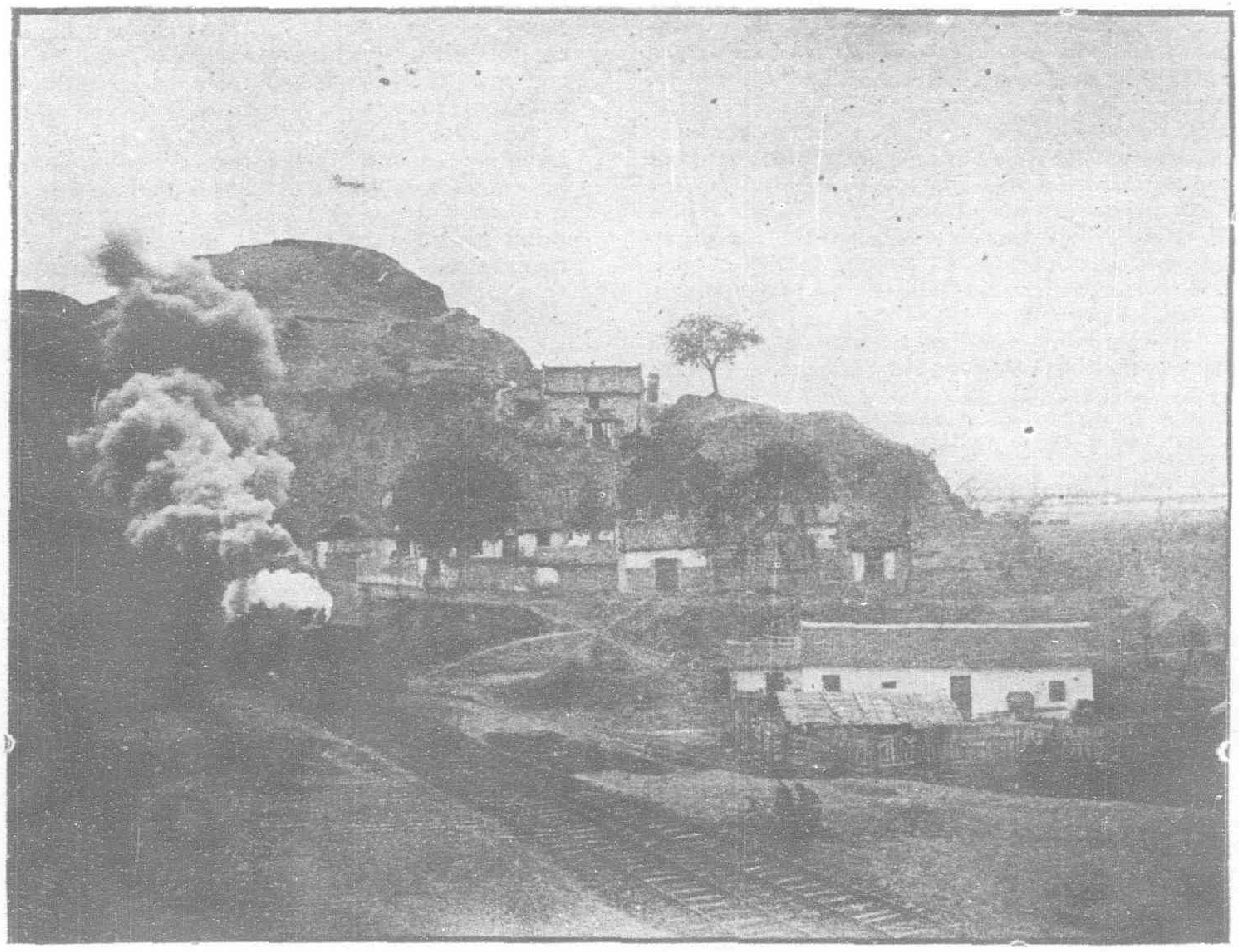
NEW GARDEN BRIDGE, SHANGHAI

Previous to 1870 those residents of Shanghai whose business took them to and fro between the Bund and Hongkew had to cross the Soochow Creek in a ferry. In 1871 an iron bridge with a "draw" span was erected by the Soochow Bridge Company. It was not a success, as it collapsed before being opened to traffic owing to the settlement of the screw pile foundations. The present wooden structure was built in 1873, but the bridge was widened, and practically rebuilt, in 1890. Some time ago it was decided to rebuild the bridge, and after considering various plans and seeking the advice of Mr. Jean de Rijke, the Council decided upon a two-span bridge. The bridge in course of erection, therefore, will consist of two spans of 170 feet each, and will be 60 wide over all—twenty feet wider than the present bridge. This extra width will necessitate the moving of the Margary Memorial a little west of its present position, and the inclusion of a small portion of the ground at present used for Municipal green-houses. The new road level will be somewhat higher than at present, in order to provide an improved headway for the creek traffic, and to allow sufficient depth for the floor beams. The abutments and pier are to be constructed of Portland cement concrete, with Soochow granite dressings. It is for these that coffer-dams are now in the process of construction. Borings have recently been taken, which show that, for a depth of at least 200 feet, the soil is an alluvial deposit of a highly micacious nature. The carriage way of the new bridge will be paved with hardwood blocks, and will carry two tramcar tracks.—*North China Daily News.*

CONSTRUCTION OF THE PEKING AND HANKOW RAILWAY BY THE FRANCO-BELGIAN SYNDICATE

(Continued from page 143.)

Chang, then Viceroy of the Province of Pechili, was looking after the final construction of the road in its northern portion. Chang-Chih-Tung must have on this occasion felt very keenly the great difference there is between the completion of a colossal undertaking and its execution. Years passed by, and the clever viceroy saw no possibility whatever of how to carry out his stupendous project. He knew well that the creation of such a railroad had, besides its economic conclusions, a very great political complexion. He knew that if China wished to prevent foreigners from possessing a new and dangerous weapon, she must construct her future railroad absolutely with her own resources. But to do this money was necessary, and it was impossible to obtain money in China.



SOUTH TUNNEL ENTRANCE TO THE YELLOW RIVER BRIDGE

BELGIAN AND FRENCH CAPITAL NEGOTIATED.—About the end of 1896, Chang and Li caused the Sung-li-Yamen to understand that the latter had much miscalculated the resources of China when it proposed that this national enterprise should be carried out without the help of foreign money. The two promoters of the project received authority to grant the concession to a company of the "most favored country." They communicated first with the United States. Chang thought that the United States had no special political design upon China; but the exaggerated pretensions of the American capitalists towards the concession compelled the promoters to seek elsewhere less onerous conditions. They then turned towards Belgium, "a very wealthy, small country, whose power is negligible," as they said in their report of December, 1897. They chose this country, guided by the above political considerations.

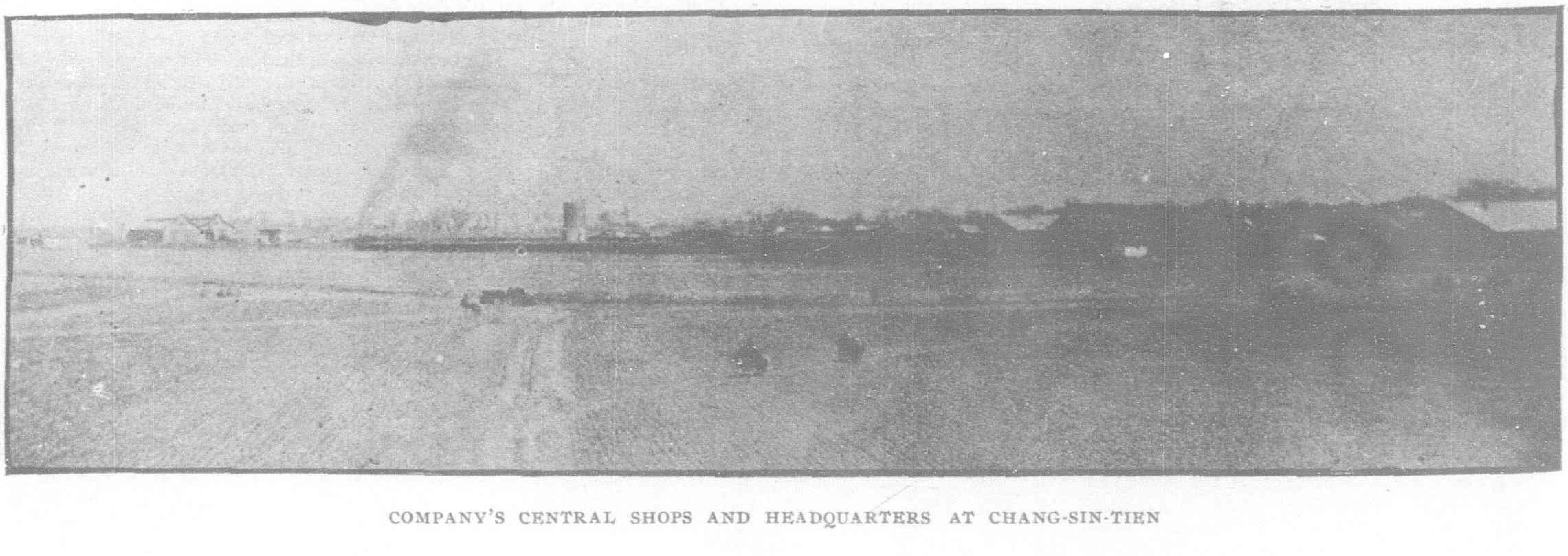
On another side, while the negotiations were taking place, M. Gérard, minister for France at Peking, thought the moment had come to remind the Sung li-Yamen about Article 7 of the Franco-Chinese Treaty of June 9, 1885, which stipulates that "in the construction of railroads, China will use all her influence to attract French industry." The political power of France was, for the Belgians, a precious auxiliary to protect, when necessary, their involved interests. The result was, therefore, a fusion of Belgian and French capital in one company.

Since 1897, a preliminary contract had been signed between the Chinese Government and the Franco-Belgian Syndicate for the construction of the railroad, and on June 26th, 1898, despite a rather strong opposition from Great Britain, the Belgian minister at Peking, M. Joostens, obtained the definite concession of the road for the *Société d'études de chemins de fer en Chine.*

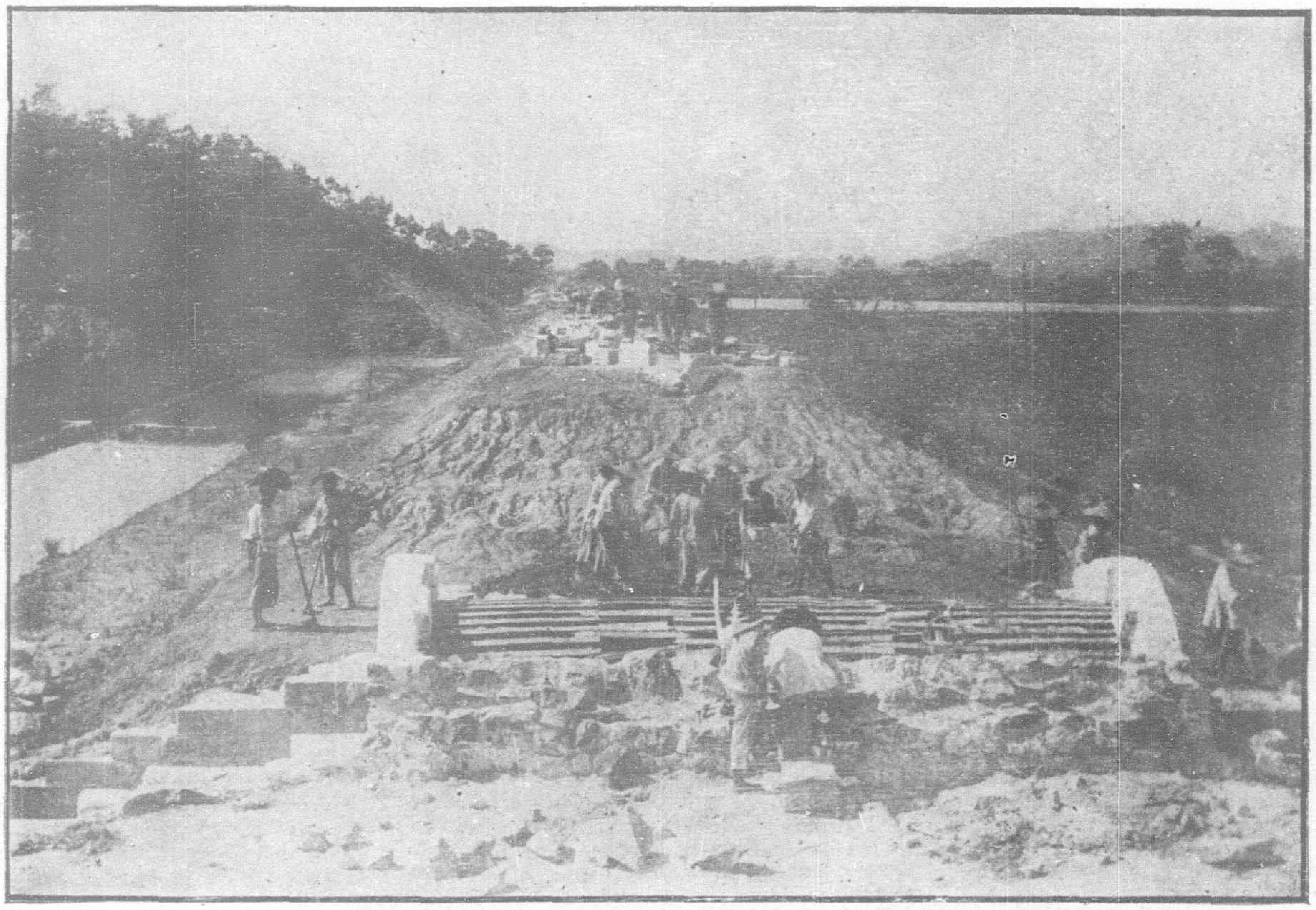
PROVISIONS OF THE CONTRACT.—In this connection it might interest the readers to know the nature of the contract that linked the Sung-li-Yamen to the Franco-Belgian Syndicate just mentioned. The Manchurian system of railroads had been built by a Russian company, and the German system by a German company. Both of these companies had been created at the risks and perils of the concessionaries, without any guarantee from the Chinese Government. It was altogether different with the concession granted to the Franco-Belgian Syndicate, which obtained not only the support of Chinese Imperial Company of Railroads, conducted by Chang, but also the official patronage of the Peking Government, which gave it financial support by working out the following combination:—

In order to facilitate the operations of the contracting company, China decided to issue a state loan. The specifications having been accepted and the amount to be spent approved by competent authority, the Chinese Government remitted to the syndicate bonds at 90 per cent sufficient to cover the expenditures decided upon. The syndicate had only to negotiate these bonds. The money obtained by this operation constituted the capital with which to build the road for the Peking Government, the contracting syndicate receiving as remuneration for its trouble 20 per cent of the net profits of its undertaking. Such was the ingenious mechanism which served as a basis for the convention concluded, in 1898, between the Chinese Imperial Company of Railroads and the syndicate. It presented this considerable advantage that the concessionaries had, in reality, not to trouble themselves about the formation of a construction capital; they had only to secure sufficient credit in order to convert into money their Chinese paper. It was thus that in March, 1899, a loan amounting nominally to 112,500,000 francs, called the 5 per cent Chinese Loan of 1898, was issued at the same time at Brussels and in Paris. The transaction seemed even then so brilliant that the loan, in Paris alone, was covered ten times over.

SURVEYS AND COMMENCEMENT OF CONSTRUCTION.—While the negotiations were going on, Chang Chih-Tung had already had the first surveys and drawings made. The road, for a short distance from Hankow, goes along the Yangtsze, then traverses



COMPANY'S CENTRAL SHOPS AND HEADQUARTERS AT CHANG-SIN-TIEN

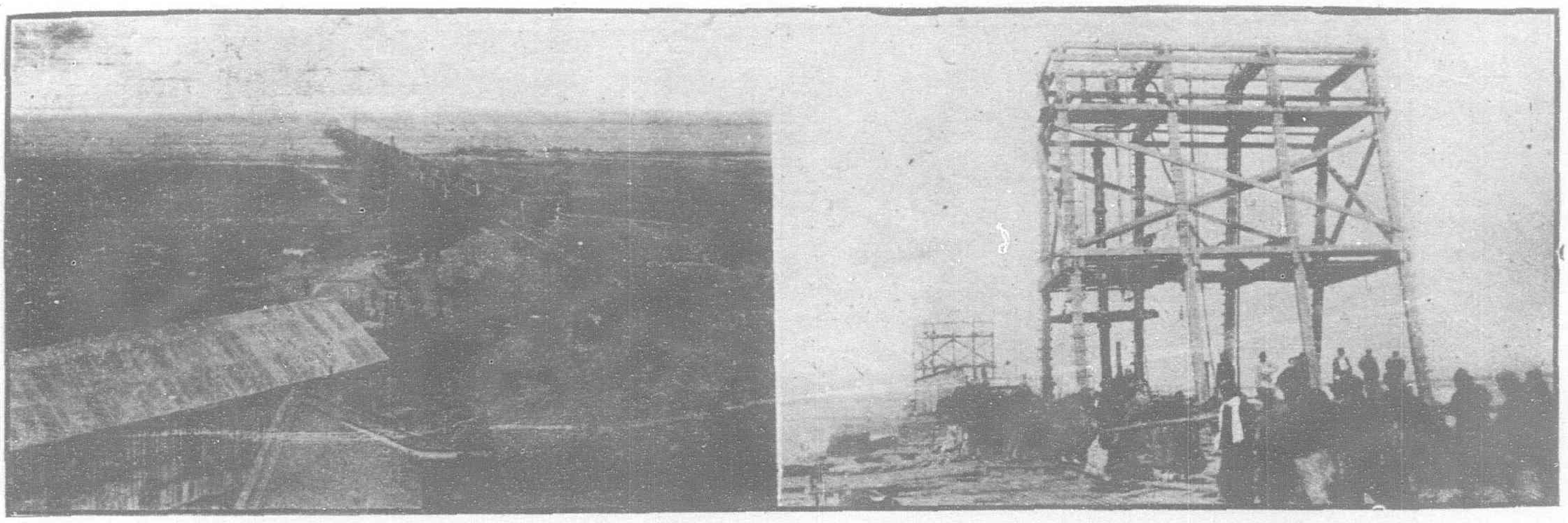


EARLY STAGE OF ROADBED CONSTRUCTION

the Hu-pei Plain. From Honan-Chau—at the 153d kilometer post—the line zigzags between steep hills forming scenery to be compared with the finest Japanese landscapes. After Sinyang, it traverses another charming plain, a little before reaching the Hwang-ho (Yellow River), where is erected on the summit of a hill a temple concentrated to the divinity of the river.

Work was begun in 1899, simultaneously on the Peking terminus and on that of Hankow. It was very actively carried on under the direction of the efficient Belgian engineer, M. Jean Jadot, as chief engineer of the Pei-Han. In this year quays and workshops were constructed, and rolling stock, materials, etc., for construction purposes, were purchased and received. It was necessary to build a great number of bridges, some of which reach a height of 420 meters. Though the work was interrupted for nearly a year—during the

ONE OF THE DEEPEST CUTS ALONG THE RIGHT-OF-WAY



GIRDER CONSTRUCTION AND SINKING SCREW-DRIVEN TUBULAR PILES FOR YELLOW RIVER BRIDGE

Boxer trouble of 1900—and though the buildings were partly destroyed, the concessionaries succeeded in building in the same year 90 kilometers of line on the Hankow section.

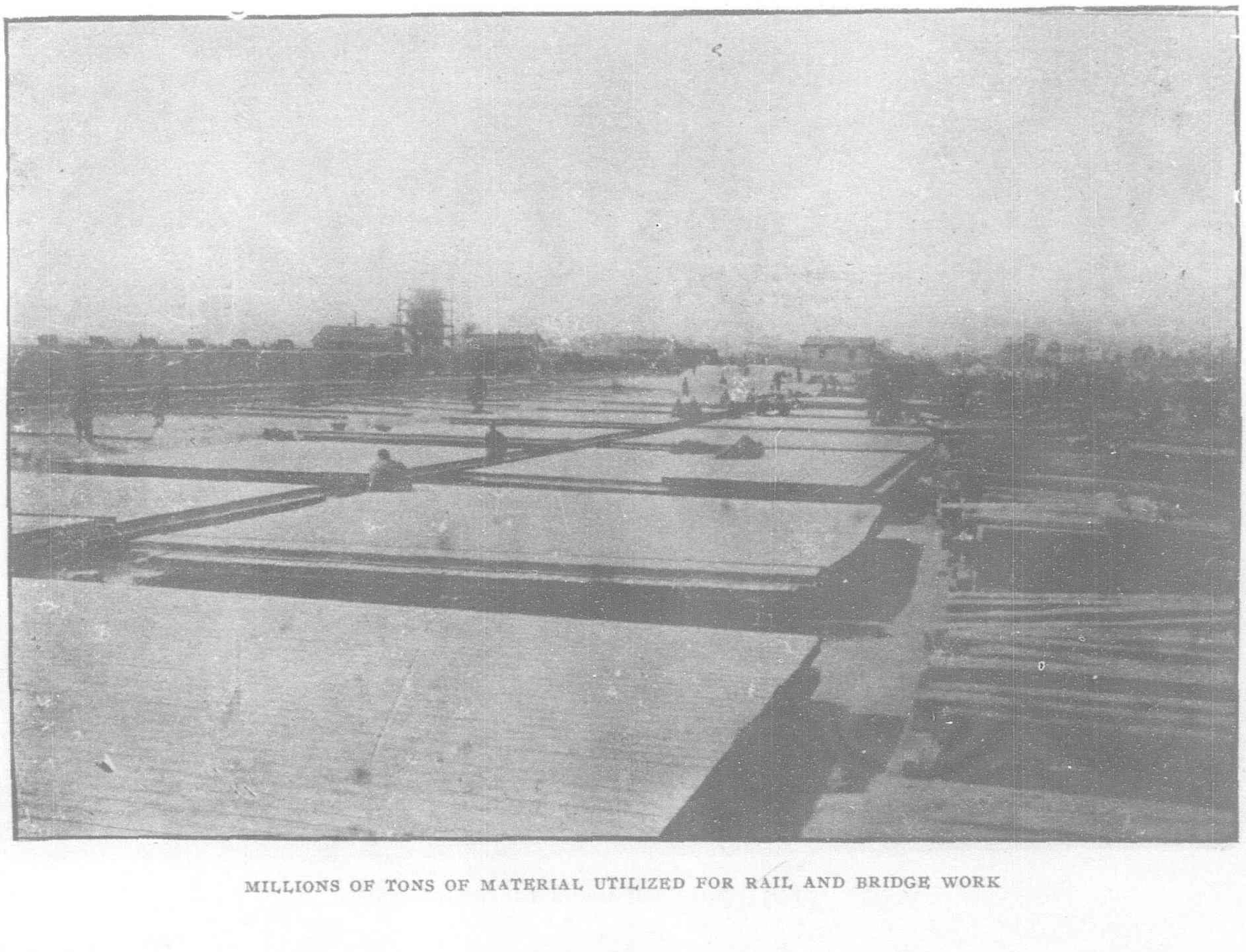
In 1901, great damage by inundation was done to the embankments between the Chinese City and the river railroad station; when the wind blew hard, the waves swept even the embankments. As this part of the road is more or less inundated every year, in summer, during the rise of the Yangtsze River, it was necessary to cover with stone the N. slope of the embankment so as to avoid annual repairs. This great work was completed at the beginning of 1902.

At Hankow, at the river railroad station, vast workshops and sheds were erected. A quay of 4,800 meters had been built all along the river, and vessels of deep draught can now come alongside. The maintenance of the quay is very costly, as the current gnaws at and mines the river, and forcing, therefore, the use of immense quantities of rock to resist its action.

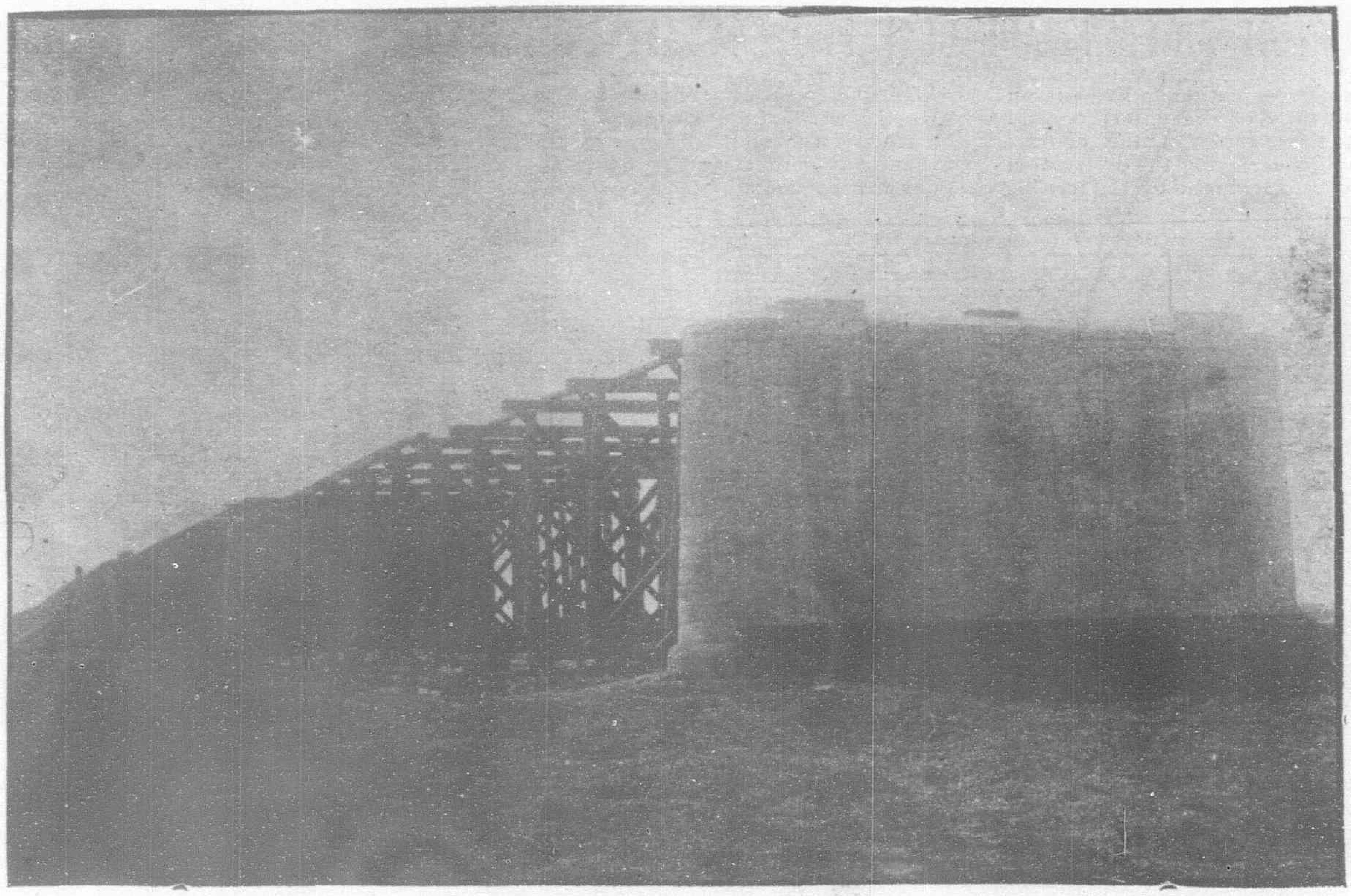
Notwithstanding the inundations, and before the end of 1901, the road was opened on the Hankow side, and its distance was 153 kilometers. There was first a weekly service from both ways, but, since the beginning of 1902, three trains weekly were needed.

At the 155th kilometer, the road traverses the line which divides the basins of the Yangtsze and Hwang-Ho rivers over a height of 200 meters. It was necessary to cut the rock through a length of 20 kilometers, and to get beyond the summit a tunnel of 350 meters had to be pierced, wide enough to allow the laying of a double track. This difficult engineering work was completed in August, 1902, and thus allowed the traffic up to Sinyang, at the 218th kilometer post. The same year saw the inauguration of a daily train service between Hankow and Sinyang, as well as the installation of a second station at Hankow, in the French Concession. In the spring of 1903, a third station was opened at Hankow, on the Han River, quite close to the wall of the Chinese City. On January 1st, 1904, the road was opened up to the 313th kilometer post at Chau-Ma-Tien. This is the terminus in the N. of the Hankow section. It is at this station where ends the immense Northern Plain and where begin the ramifications of the hills which form more southerly the boundaries of Honan and Hu-Pei. Some of the slopes are steep, and there it is necessary to add more locomotives to the trains. The heavy trains coming from the N. are transformed into light ones at Chou-Ma-Tien for the Hu-Pei and the Yangtsze, and *vice versa*.

Great Yellow River Bridge.—At the beginning of December, 1904, on the Hankow side, rails were laid up to the Hwang-Ho River—500 kilometers. Across this waterway the gigantic Hwang-Ho River bridge has been constructed. This structure is 3010 metres long. The construction of this bridge was a unique feat in engineering and one on which the eyes of the engineering world was earnestly fixed. It is about 6.25 meters above high-water level, and is of steel throughout,



MILLIONS OF TONS OF MATERIAL UTILIZED FOR RAIL AND BRIDGE WORK



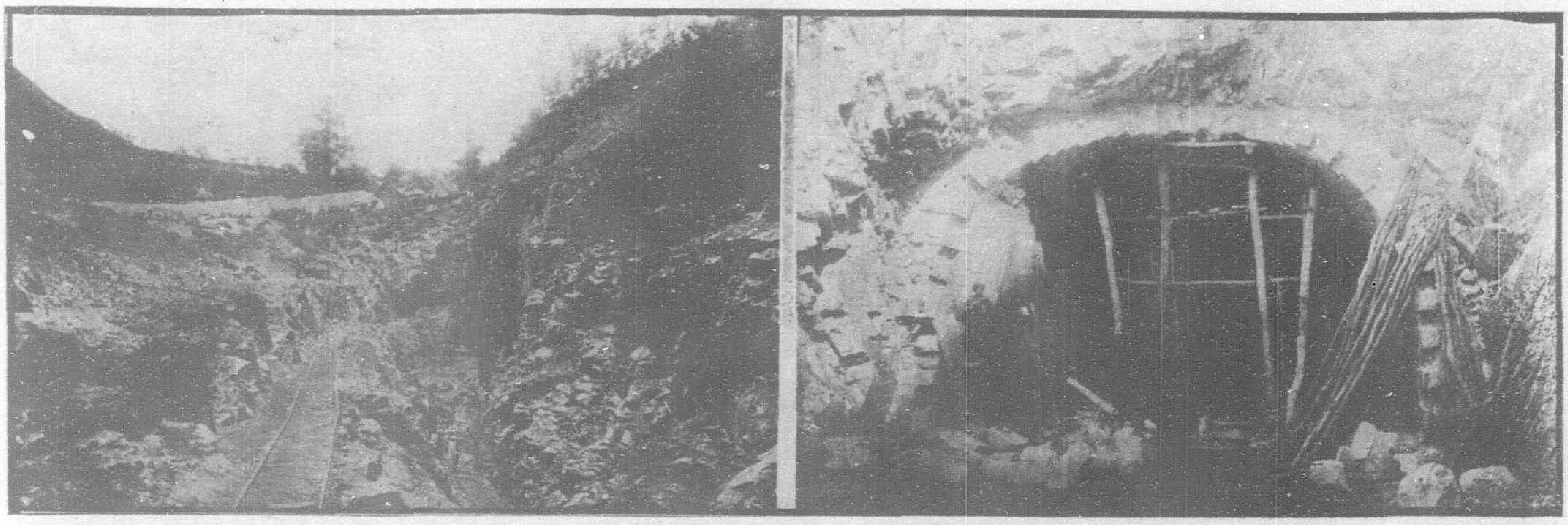
GENERAL TYPE OF PIER CONSTRUCTION

the massive girders being supported on sets of screwdriven tubular piles. The steel piles were screwed into the bed of the river by means of hand capstans manned by squads of coolies. In fact all bridges are of steel and like construction, while the approaches and other masonry work are of concrete. The bottom end of each pile has a tooth point with a large inclined blade above it, not unlike the tip of a corkscrew. To each point was clamped an enormous grooved pulley, around which was wound a wire hawser. One end was led to one of the capstans, and then the coolies heaved away and the work of screwing began. The rotary motion of the piles, with the corkscrew blade, naturally screwed the pile down into the mud till the pulley was level with the platform on which the workmen were standing. When the pulley reached this platform, another length of pile was bolted together, the pulley raised to the upper flanges, and the screwing resumed. When the piles had been screwed to a sufficient depth, say 12 to 15 meters, the water was pumped out from the interior. The pile was then filled with concrete. Wooden piles were then driven around the current side of the piers in the shape of a triangle, with the points to the current, as a protection to the structure. Huge beds of tree branches, lashed together with wire, were then sunk around the steel piers, and on these beds hundreds and hundreds of tons of rock were thrown. This was reckoned to give more solidity to the river bed where the piers were driven, and possibly prevent the river washing away the foundations, if such the shifting bed of the river can be called. The steel piles were placed in sets of four, six, eight, and ten, and each pile is joined by stanchions and girders of great strength, and finally each set of piles is spanned by an enormous girder on which the rails are laid. Half of this bridge was built in France, the other half in Belgium, the work being distributed among the principal builders of the two countries.

The river bed is one gigantic quicksand and during the construction of the bridge many piles were sucked under as well as platforms supporting machinery. Breakwaters of stone have been built along the banks of the river to prevent the undermining of the bridge foundations, and either end of the structure is protected with stone-faced dykes to prevent the water washing away the dykes.

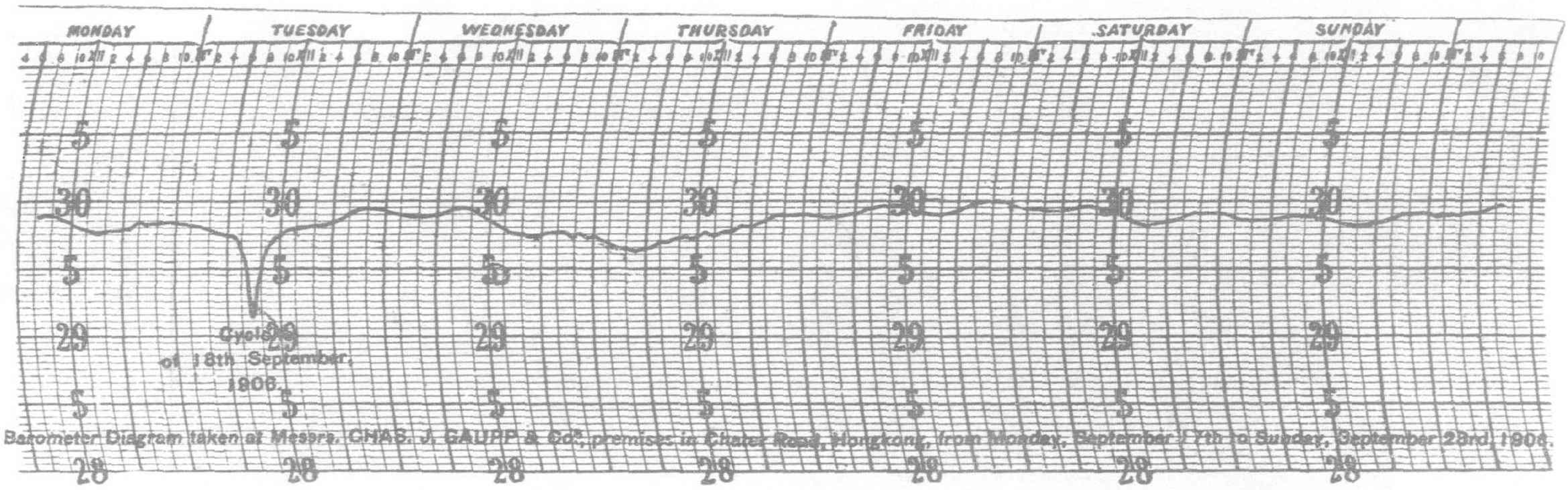
The construction of the Peking section of the line went on apace with that of the southern section, and the conjunction was formed at the Hwang-Ho River bridge. The road is now, and has been for several months, in operation through from Peking to Hankow.

ROADBED, TRACKS, GAUGE AND ROLLING STOCK.—The roadbed is well-built and solidly ballasted, over which the most powerful locomotives may work at full pressure. The gauge is the same as that prevailing in Belgium, and the rails were all submitted to a most severe test at Hanyang where they were mostly manufactured. These tests were those enforced by the Belgian Government for its railways. The weight of the rails is 37.6 kilograms per meter. The rolling stock is modern and plentiful, and some of the trains which run through from Peking to Hankow and *vice versa* are equal in appointment and speed to many similar trains on European lines. There are three classes for passengers, the cars for the 3d-class being open. The fare is about 3 cents. The rates for 1st and 2d-class are about 9 and 6 cents per kilometer.



TEMPORARY CONSTRUCTION TRACK AND TUNNEL WORK NEAR YELLOW RIVER

DESTRUCTION OF SHIPPING AND DOCK PROPERTY AT HONGKONG



Barometer Diagram taken at Messrs. CHAS. J. GAUPP & Co., premises in Chater Road, Hongkong, from Monday, September 17th to Sunday, September 23rd, 1906.

With remarkable resignation and an energy that speaks eloquently of the enterprise and public spirit of the people of the colony, Hongkong is rapidly restoring the destruction and damage that was wrought by the terrible typhoon which visited that port on the morning of September 18th.

The wholesale destruction which the storm caused to shipping and harbor property has appalled the entire oriental country. Aside from the awful loss of human life, which probably never will be reliably computed, the calamity affected all classes of shipping the most. Floating craft of every description—from sampan and junk and yacht to river and sea-going vessels—were destroyed or went down in the fury of wind and wave. Wharves, piers, godowns, and shipbuilding industries were either totally wrecked or badly damaged, while most of the roads in the lower sections of the city were deluged with water and blocked by debris of every description.

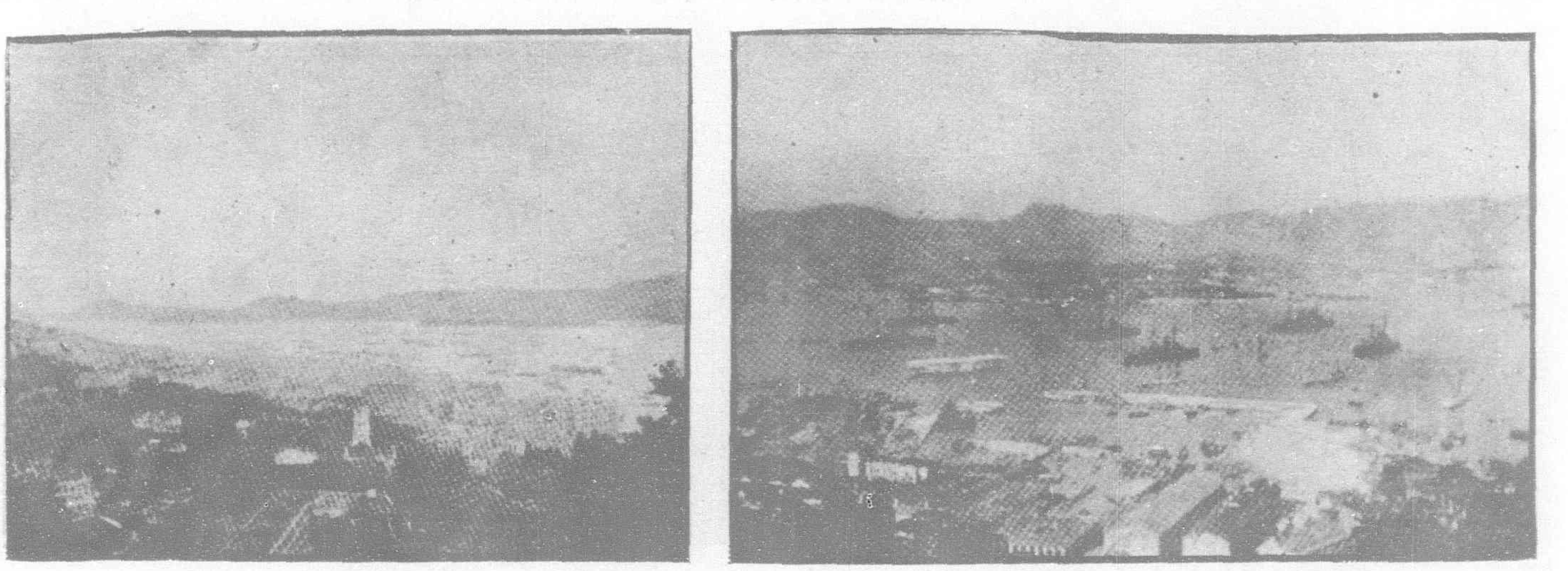
The number of water craft totally or partially wrecked is now estimated at about 1,500. Sampans and junks were smashed to pieces in the Praya Wall, where boats and wreckage were swept by the waves right on the roadway and the wreckage piled in places to the height of several feet. Opposite the Blue Buildings, against the stone pier at Observation Place, at the sugar works, on Kellett Island, and from the Navy Yard to Bowrington there was abundant evidence of the fury of the storm. At Ah King's slipway the fleets of the Royal Hongkong and Corinthian yacht clubs were almost completely destroyed, and it was here that Mr. W. H. Donald, editor of the *China Mail*, lost his $1,000 house-boat. The route to West Point along the praya was a scene of destruction and ruin, while westward from Blake Pier Connaught-rd was piled with wreckage from the harbor.

Kowloon was harder hit by the typhoon than any other part of the colony. The devastation wrought here was appalling. The full force of the gale centered upon this section. Wharves disappeared, seawalls were broken down, railway beds with masses of concrete were wrenched from the ground and crumbled up, junks and sampans were tossed upon the praya as jetsam, big ships were dragged from their moorings and tossed against the walls, others suddenly sank where they lay, and hundreds of the boat and maritime population perished.

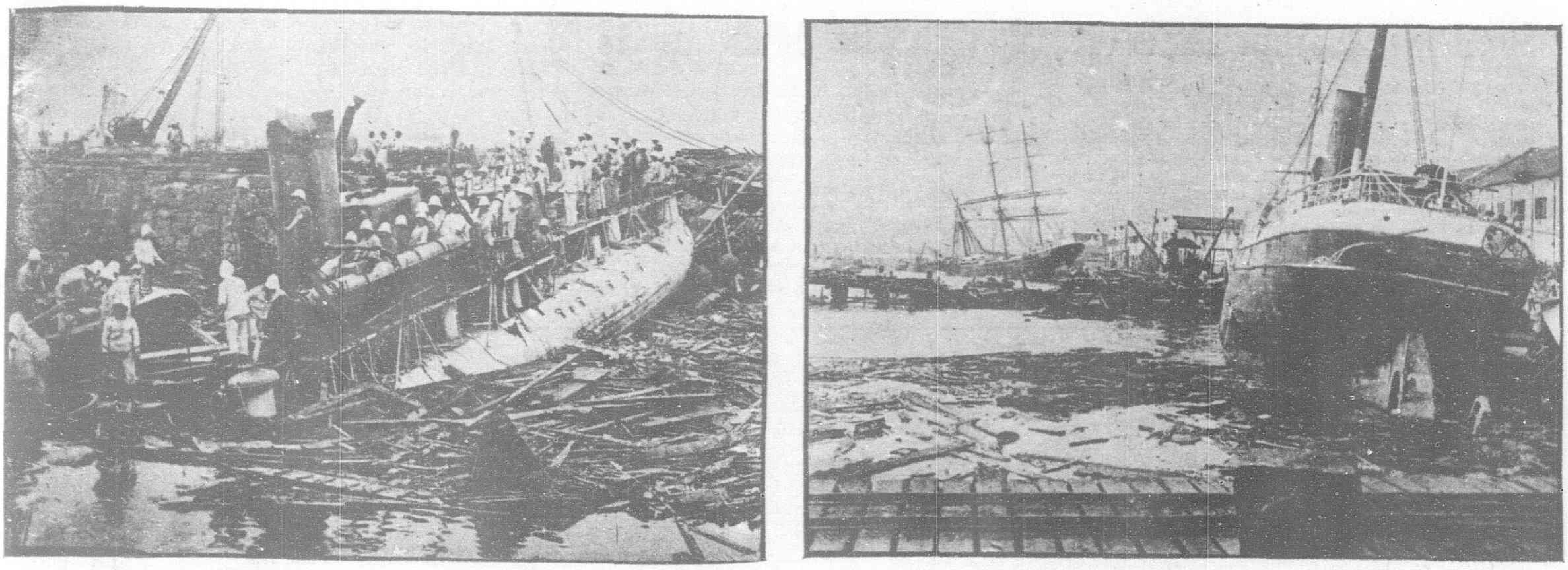
Yaumati Bay was littered with wreckage, junks and sampans lay in the streets, jetties were destroyed, and many houses collapsed, burying, it is estimated, 200 persons beneath the ruins. Seven launches of the Hongkong and Whampoa Dock Company, Ltd., were lost.

The official record of maritime losses and damage to shipping was as follows, at last account:—

BRITISH.—*Fatshan*, 1,425 tons, broke loose from buoy and after colliding with the French Mail steamer *Polynésien*, stranded in Hunghom Bay and was badly damaged; refloated on September 28th; *Monteagle*, 3953 tons, stranded N. of Torpedo Depot and stern-post and rudder stock broken; refloated on Septemher 20th, and to be repaired at Kowloon docks; *Kwongchow*, 507 tons, sunk at Kowloon Point and nearly 400 persons lost; *Strathmore*, 2,296 tons, badly damaged in collision with steamer *Quinta*, and repairs being effected; *Wingchai*, 548 tons, ran on rocks at Samshuipo, and wreck to be sold at auction; *Kongnam*, 402 tons, sunk in Yaumati Bay; ten lives lost, including four Europeans; *Changsha*, 1,463 tons, stranded and slightly damaged at Kowloon docks; refloated on September 20th and repairs effected; *Takhing*, 395 tons, stranded at Samshuipo; salvage operations in progress; *Kinshan*, 1,092 tons, ran ashore at Tai Lam Chow Island; salvage operations in progress; *Heungshan*, 979 tons, ashore at San Chau Island with rock through her bottom plates and other serious damage; salvage operations in progres; *San Cheung*, 389 tons, sunk alongside of Canton Wharf after being washed over that at which she was lying; feared total loss; *Pakkong*, 295 tons, total loss in Yaumati Bay; *Hongkong*, 413 tons, foundered in Yaumati Bay; total wreck; thirty-two lives lost; *Sun On*, 113 tons, stranded in Yaumati Bay; refloated with slight damage; *Shun Lee*, 380 tons, superstructure damaged while lying at the company's wharf; *Coptic*, 2,744 tons, in collision with *Petrarch*, while at her buoy; bow plates on both sides damaged; left port without being repaired; *Loongsang*, 1,093 tons, received slight damages in collision with steamers *Chip Shing* and *Haimun*; *Sierra Marena*, 2,283 tons, received minor damages while lying off Quarry Bay; *Chip Shing*, 1,199 tons, port side damaged in collision with steamers *Loongsang* and *Fooksang*; *Kutsang*, 3,110 tons, damaged in collision with steamer *Charles Hardouin*, repairs effected; *Albatross*, 83 tons, sank near the Nine Pins; 113 lives lost, including those of the captain and chief engineer; H. M. S. *Pheonix*, 1,050 tons, ashore on her side close to the Torpedo Depot; total loss; H. M. S. *Taku*, destroyer, damaged while in Torpedo Depot camber, Kowloon; H. M. S. *Moorhen*, gunboat, slightly damaged while inside Naval Camber; H. M. S. *Robin*, gunboat, slightly damaged and since repaired; *Fooksang*, 1,987 tons, slightly damaged in collision; *Radnorshire*, 1,820 tons, stranded at Yaumati Bay, and bows damaged in collision with steamer *Monteagle;* partly repaired; *Poona*, 4,878 tons, slightly damaged while at Kowloon Wharf; *Canada*, 51 tons, blown a shore and broken up on the rocks at the head of Junk



HONGKONG HARBOR FROM THE PEAK AND SHOWING NEW NAVAL DOCKS



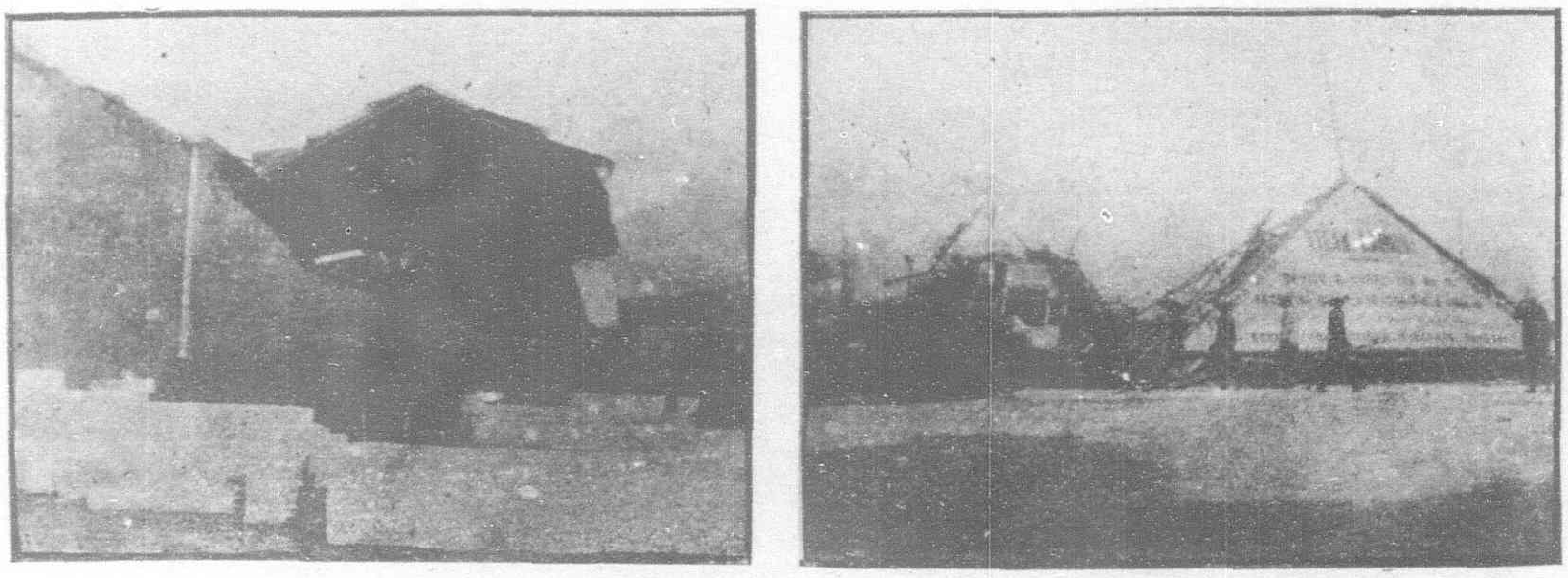
Photos by *Mumeya*, Hongkong.

FRENCH DESTROYER "FRONDE" WRECKED IN A CORNER AT KOWLOON; AMERICAN SAILING SHIP "S. P. HITCHCOCK" AND GERMAN STEAMER "PETRARCH" ASHORE AT KOWLOON PRAYA; NOTE DESTROYED WHARVES

Bay; *Choysang*, 1,424 tons damaged in collision and departed without repairs; *Haimun*, 636 tons, minor damage; *Tauian*, 1,042 tons, slightly damaged; *Hoichung*, river steamer, broken up in Yaumati Bay; total loss; Govt. hospital ship *Hygeia*, roof blown away.

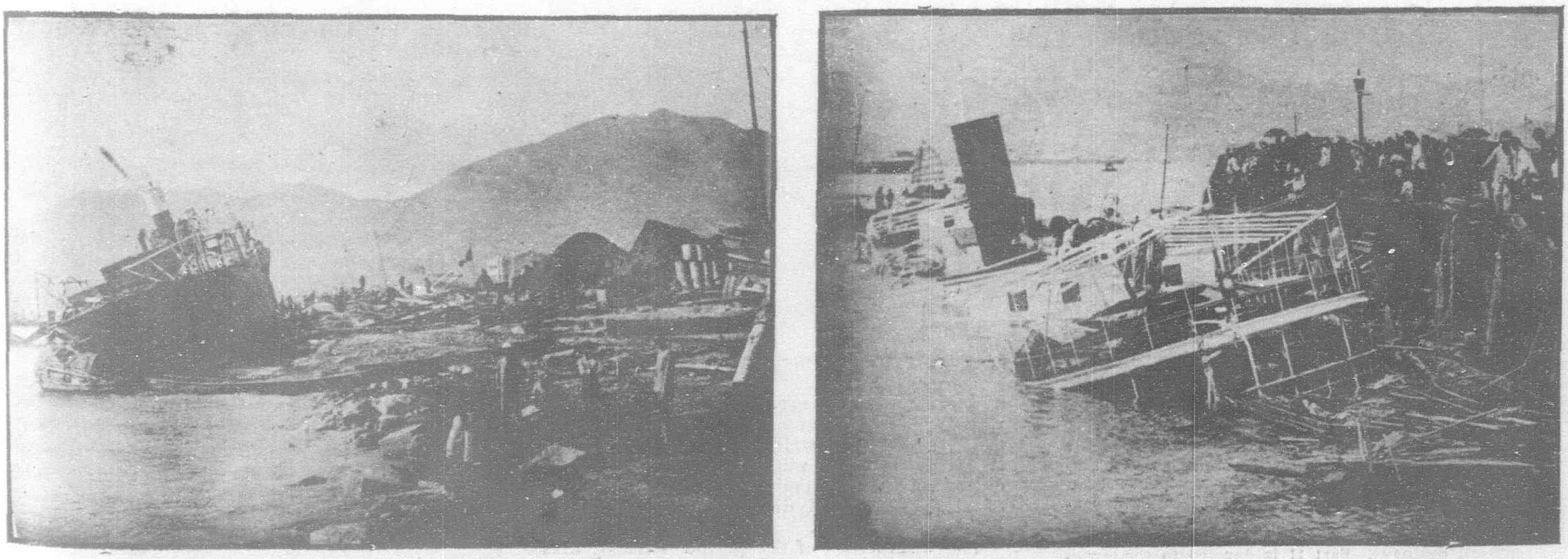
GERMAN.—*Prinz Waldemar*, 1737 tons, stranded and damaged in Yaumati Bay; repairs being effected; *Apenrade*, 616 tons, sunk off west end of Stonecutters Island; salvage not started; loss of life believed to be 27; *Johanne*, 952 tons, damaged in collision with steamer *Chow Tai;* became partly submerged and was refloated by salvage ship *Protector*; *Signal*, 907 tons, stranded on rocks in Yaumati Bay and afterwards beached; extensive damage; steamer now under repairs; *Petrarch*, 1252 tons, drifted from her anchorage at Stonecutters and collided with several vessels; stranded at Kowloon wharves with large hole in side and several in bottom; *Emma Lukyen*, 1109 tons, stranded at Mongkoktsui, badly damaged, *Sexta*, 992 tons, stranded in Kowloon Bay;

(Continued on page 165.)



Photos by *Mumeya*, Hongkong.

F. BLACKHEAD & CO.'S GODOWN AT KOWLOON FERRY WHARF

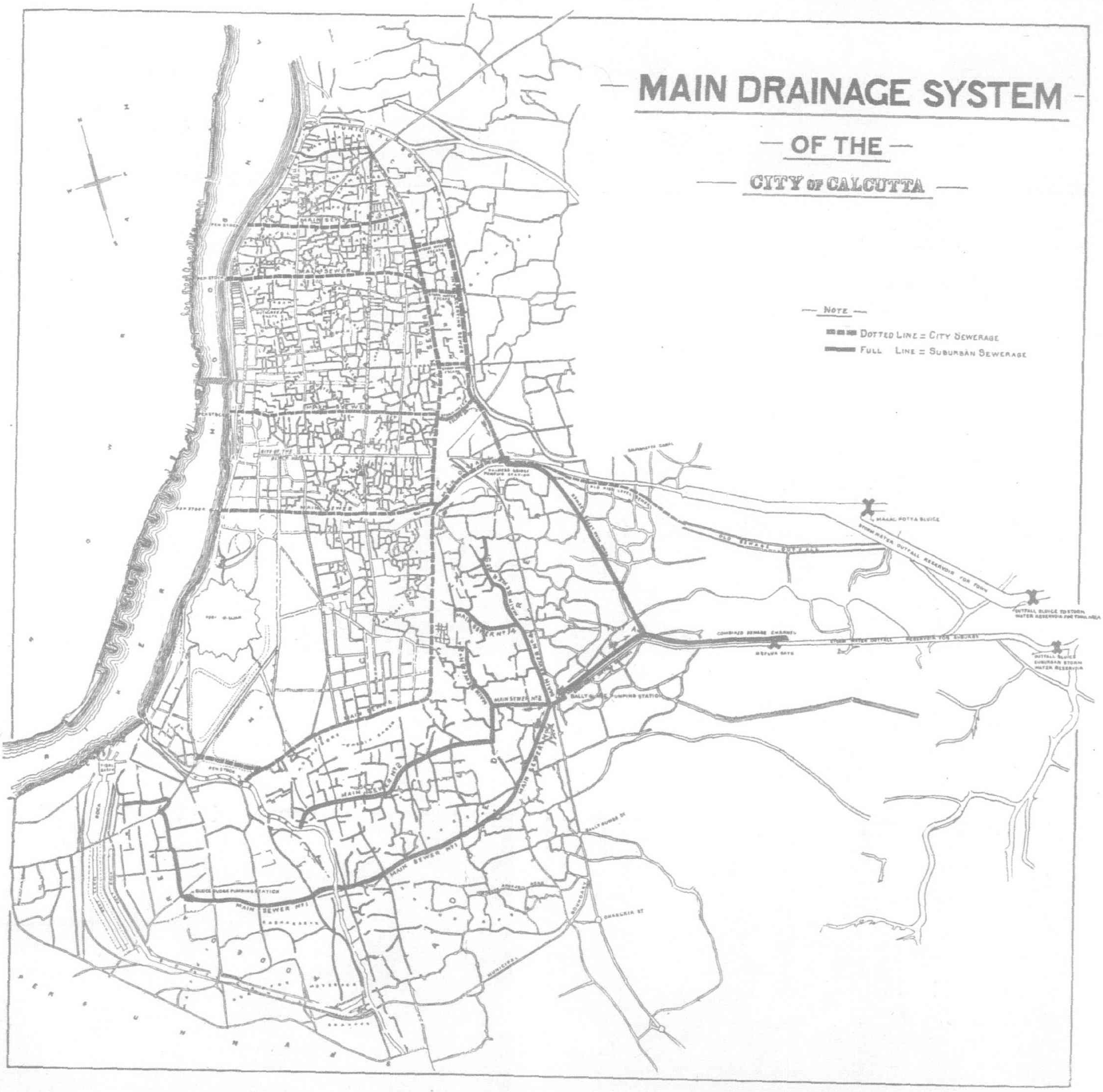


Photos by *Mumeya*, Hongkong.

STEAMER "NUESTRA SEÑORA DEL ROSARIO" AGROUND AT YAUMATI; RIVER STEAMER "SAN CHEUNG" SMASHED AT HER WHARF

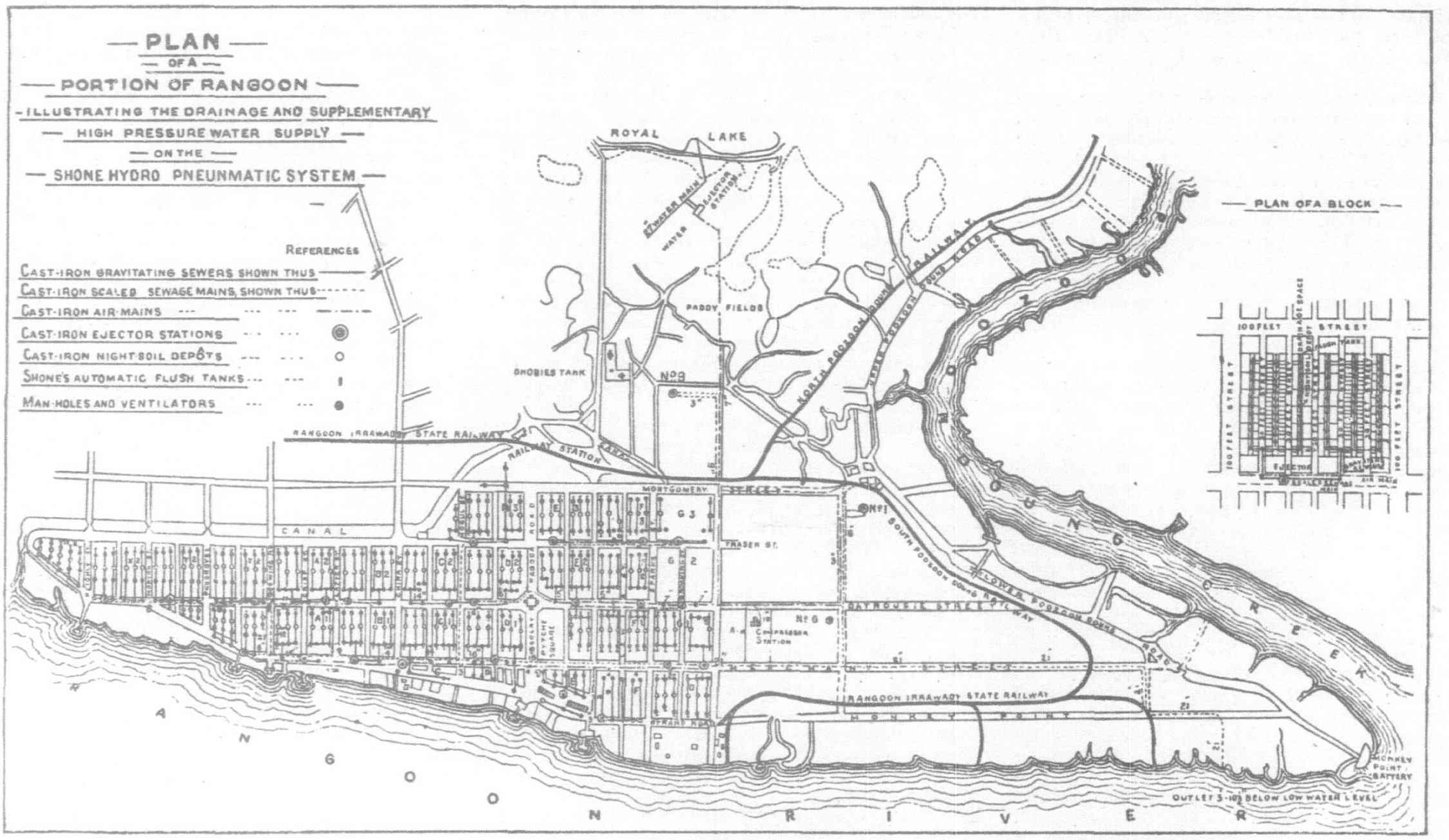
SOME INTERESTING DRAINAGE PROBLEMS OF ORIENTAL CITIES

[*Drainage Problems of the East*, by C. Crakeet James, M. I. C. E., examiner in sanitary engineering to the University of Bombay, is one of the most valuable and instructive work of its kind that has yet come to the office of THE FAR EASTERN REVIEW. It is a revised and enlarged edition of *Oriental Drainage*, written by the same author, and comprises two volumes one of which is devoted exclusively to plans detailing the drainage systems of most of the principal cities of the Orient. The author shows familiar and exhaustive knowledge of the subject he handles, and in his book furnishes to the profession a fund of information about sewerage engineering methods in the field he covers. The Shone and Ault systems seem to be guiding feature of the work. The work is published at the office of the *Times of India*, Bombay, and is also on sale at 121 Fleet-st, London. Part I, Vol. 1, deals with drainage systems, sewers and their construction, public conveniences, house connections, sewage disposal, tank gas, and surface water and sub-soil drainage. Part II is devoted to the sewerage systems of the municipalities, and it is with the most important of these systems that this review purposes to deal. Price Rs. 20 lor.$6.60 gold.]



SEWERAGE OF CALCUTTA.—Calcutta is situated in the Lower Gangetic Delta, on the E. bank of River Hoogli in latitude 22° 33′ 47″ N. and longitude 88° 23′ 34″ E. In 1905 its revenue was nearly 69 *lakhs* of rupees. The city was founded in 1690, but it was not until 1856 that the municipal authorities awakened to a sense of their duties, and took steps to provide the city with a pure water supply and a proper system of underground drainage. The water had previously been obtained from the river opposite the city and from wells and tanks, the inhabitants storing the water in *chattis* and precipitating the suspended matter by the aid of alum. The foul drainage passed away in filthy open drains.

The authorities of the period were by acts passed in 1856 required to carry out complete systems of pure water supply and drainage, and were empowered to levy rates and borrow money for such works. Schemes for both improvements were prepared and approved with little delay. The water supply was obtained by pumping from the river at Pulta, 20 m. above Calcutta, where the water was free from salt and to possible pollution from the sewerage of the city. The supply commenced in 1870 at 6,000,000 galls. per day, equivalent to 15 galls. per head of the population, which appears to have been about 400,000 at the time. The water was pumped from the river into settling ponds, filtered, and brought by gravitation through a 42″ cast-iron main, 12 m., to a reservoir in the city, from which it was distributed through branch cast-iron pipes along the principal streets. Cast-iron pipes were also laid for the distribution of unfiltered water from the city pumping station (since dismantled) at Chandpal Ghat. The filtered and unfiltered water supplies have been gradually extended to the conditions which obtain at the present day, the former now amounting to 20,500,000 galls.


PLAN
OF A
PORTION OF RANGOON
ILLUSTRATING THE DRAINAGE AND SUPPLEMENTARY
HIGH PRESSURE WATER SUPPLY
ON THE
SHONE HYDRO PNEUNMATIC SYSTEM
REFERENCES
CAST-IRON GRAVITATING SEWERS SHOWN THUS
CAST-IRON SCALED SEWAGE MAINS, SHOWN THUS
CAST-IRON AIR-MAINS
CAST-IRON EJECTOR STATIONS
CAST-IRON NIGHT-SOIL DEPÔTS
SHONE'S AUTOMATIC FLUSH TANKS
MAN-HOLES AND VENTILATORS
ROYAL LAKE
PLAN OF A BLOCK
PADDY FIELDS
DHOBIES TANK
No 9
RANGOON IRRAWADDY STATE RAILWAY
RAILWAY STATION
CANAL
MONTGOMERY STREET
FRASER ST.
DALHOUSIE STREET
No 6
COMPRESSOR STATION
No 1
NORTH POZOONDOUNG ROAD
SOUTH POZOONDOUNG ROAD
LOWER POZOONDOUNG ROAD
POZOONDOUNG CREEK
MONKEY POINT
MONKEY POINT BATTERY
OUTLET 3-10 BELOW LOW WATER LEVEL
RANGOON RIVER

per day to a population of 960,000 which includes the supply to small areas outside the municipality, the latter 15,500,000 galls. per day to a population of about 740,000 persons.

The geographical formation of the site of Calcutta for a depth of 20 to 30′ is loam, sandy clay, and clay; a peat bed of about 18″ can be struck at varying depths of 20 to 30′ below the surface. A boring has been made to a depth of nearly 500′, but no rock was met with; sand and pebbles were struck at about 200, 300, and 400′, and peat beds at 30 and 300′ below the surface. The absence of marine fossils shows that the strata denote deposits of fresh water, while the peat beds would indicate former land surfaces.

The surface is practically flat inclining from W. to E. with a slope of about 1 in 1,000. The area at present within the jurisdiction of the municipality extends roughly N. and S. about 7 m. The area of the city including the canal fringe is 4,237 acres; and that of the city, Fort William, Maidan, and added area 13,2 37 acres. The population in 1901 of the city, including the canal fringe, was 588,000, and that of the city and added areas 848,000.

The original sewerage project for the city proper was designed by Mr. Clarke in 1857; it was commenced in 1859. Brick egg-shaped sewers were built under the main streets, stoneware pipe sewers in lanes and valleys. By 1875, 35 m. of brick and 37 m. of pipe sewers were constructed. The sewers gravitated to the pumping station at Palmer's Bridge, where the sewerage was lifted about 10′ to a high level sewer by which it was conveyed about 8,000′ to the "Salt Lakes" (swamps to the E. of Calcutta). The greater part of the storm-water was discharged by storm reliefs into the Circular Canal. The local government subsequently objected to the storm water being any longer discharged into this canal, and in 1882 the municipality was compelled to construct an intercepting sewer for the purpose of collecting the storm-water, and discharging it to an open cut at Palmer's Bridge. This open cut conveyed the storm-water from the main outfall and intercepting sewers to the Makalpotta reflux gates, through which it passed to the Bhidiadhurry River. By 1884 the old project and drainage of the city proper was practically completed.

In 1888 the area of Calcutta was augmented considerably by the addition of the canal fringe, and suburban, generally known as the "added," areas. It then became necessary to prepare drainage projects for dealing with these extensions, and altering the city outfalls to meet future requirements. Projects were formulated by the municipal engineers, and Mr. Baldwin Latham was asked to give his advice. He visited Calcutta and, *inter alia*, pointed out serious defects in the old city system of sewers in cases where the branches join the main "invert to invert," with the result that the free sewerage flow from the branches in such cases is retarded and silt deposits take place, which has to be removed by hand at considerable expense. His recommendation in regard to the alignments and sizes of sewers for the new project was not adopted, although his advice generally was greatly appreciated. The counsel of the municipal engineers prevailed with the Corporation and the works, estimated to cost about 68 *lakhs* of rupees, were placed in the hands of the contractors in 1897. Through certain informalities, the works were suspended under the order of the government in 1900. Fresh plans of the scheme were prepared and submitted to Mr. Latham again for his report in 1901. His report had the effect of causing a large part of the project not already executed to be considerably modified, and the scheme in its modified form is not rapidly approaching completion.

The Calcutta drainage system (old and new) of the present day, as completed or being carried out, is roughly represented in an accompanying plan. Only the main collecting sewers of the city area are shown and are indicated by black lines.

The whole of the city sewers gravitate to the pumping station at Palmer's Bridge. This station has been practically reconstructed under the new project, and two out of three of the old horizontal centrifugal pumps of the original station have been replaced by five compound vertical inverted condensing centrifugal engines of about 100 l. h. p. The pumps with 136 r. p. m. are each capable of lifting 2,100 cu. ft. per min. through a height (lift and force) of 15′ through the town high level sewer. They show an efficiency of 63 per cent. The suctions have no foot valves, the pumps are charged by steam injectors in the pump casings; there are no valves in the pump except a sluice valve on the delivery worked by a hydraulic pump. During the period these pumps have been in use, *i. e.*, about 2 yrs., this installation, which was supplied by Messrs. James Simpson & Co., have proved to be most suitable for pumping sewerage. Three of the pumps are capable of dealing with the maximum sewerage flow of about 5,880 cu. ft. per min. per 1,000 of the population of the area to be drained, 4,237 acres. The balance of power will deal with flush water and future increase. The summits of the main sewers are carried to the banks of the Hooghli where penstocks are fixed for the purpose of periodical flushing, *i. e.*, two or three days in every fortnight, when the height of the tides admits this to be done.

There are silt pits at Palmer's Bridge with wrought-iron bar screens, 1½ spaces, to intercept matters that are inadvisable to pass to the sumps. The sewers are said to be capable of taking ¼″ of rainfall per hr. from the area drained and consequently discharge on the combined system. When the storm-water overcomes the capacity of the pumps or rises to a level above which the outfall sewers are likely to become surcharged, penstocks at Palmer's Bridge are opened, and the storm-water flows to a storm-water head-cut and reservoir, recently excavated through the Salt Lakes, 4½ m. long and 100 to 700′ wide, having a capacity of 52,000,000 cu. ft., and capable of storing ¼″ of rainfall per hr. from the city area throughout the duration of the most inconvenient interval between tides in the Bhidiadhurry River, which was found by tide gauges to be 8½ hrs. At the two outlets of the reservoirs, sluices, fitted with Stoney's roller gates, have been erected to prevent the influx of river water, and admit of the contents of the reservoir being discharged through 4½ hrs. of the ebb-tide; the Makalpotta sluice, which has replaced the old reflux gates, has three gates, 14′ wide and 17′ high, and the Byntolla sluice five gates, 15′ wide and 19′ high. The depth of water to which the above quantity is estimated to rise over the sills of the Byntolla sluice on the inside is 11′ 6″. The river water on the outside rises to 17′ above the sill.

A new high level sewer, 8′ in diameter, capable of discharging 15,000 cu. ft. per min., has been constructed from Palmer's Bridge to what is known as Point A, where with the discharge of the suburban system, the city sewerage will flow along an open V-shaped concreted channel to the suburban storm-water reservoir, finally discharging into the Bhidiadhurry River through the suburban storm-water reservoir and sluice. Reflux gates are erected at the head of this reservoir to prevent the sewerage backing towards the city.

The suburban sewerage system now being carried out at a cost of some 45 *lakhs*, out of the budgeted 68 *lakhs* of rupees, and the new outfall works, are designed for any emergency. The main sewer (No. 1), draining 2,516 acres, is capable at its outfall of discharging 8,900 cu. ft. equivalent to a maximum average sewer flow of 1,258 cu. ft. per min. or 10 cu. ft. per min. per 10,000 of the estimated future population of 125,800 taken at 50 per acre (the last census return for the area 33, plus 50 per cent increase), with a velocity of 2¼ to 2½′ per sec. and also 7,642 cu. ft. per min., or say 3 cu. ft. per min. of rainfall per acre of the area drained. The sewers for the higher district will gravitate to the Budge-Budge-rd steam-power pumping station, where both sewer and rainfall together will be lifted 13′ by two centrifugal and two direct-acting horizontal plunger pumps of a total of 54 p. h. p. The discharge will pass along a high level surface sewer to the Tolly Nullah tidal channel, under which it is proposed to syphon it through two 30″ diameter steel tubes laid through the bed of the nullah. The sewer then continues eastward to deliver these quantities to the silt pits at Ballygunge pumping station.

Main sewer (No. 2), which near its outfall also takes the discharge of main sewers 4 and 5, was modified after 1901, and provides for the discharge of 10 cu. ft. per min. per 1,000 of the estimated future population, plus twice that quantity of rainfall, or ⅓ sewerage and ⅔ rainfall, from an area of 1,406 acres. The velocity of the maximum future sewerage flow is estimated to range between 2¼ to 2½′ per sec. in the main sewers and between 2½ to 3′ per sec. in the branch sewers. When the sewers flow full the velocity will be increased about 11 per cent. The future population is taken at the last census rate for the district drained, of 60 per acre plus 50 per cent increase, or 90 per acre, and the rainfall is estimated at ¾″ per day over 1,406 acres. The full bore capacity of the sewer is estimated at 1,265 cu. ft. per min. of sewage, plus 2,540 rainfall, or 3,805 cu. ft. per min., which will discharge into the silt pits at Ballygunge pumping station. The branch sewers of both mains range between 24 to 6″ in diameter, and at the summits (generally 9, 8 or 6″ sewers) is a Miller's automatic flushing chamber.

The Ballygunge pumping station will be provided with four Tangye coupled compound surface-condensing centrifugal side-suction pumping engines, each capable of raising through a height of 18′, 1,760 cu. ft. per min. or through a height of 10′ 6″ direct into the suburban storm-water head cut, by which it will flow to the storm-water reservoir and be discharged through the suburban sluice gates to the Bhidiadhurry River.

The high level sewer will deliver the sewerage at Point A, where with the city sewage it will continue in the combined sewage channel to the suburban storm-water reservoir and pass out into the river through the suburban Byntolla sluice, which is a sluice of three bays fitted with Stoney's roller gates of a similar design to those of the Byntolla town sluice.

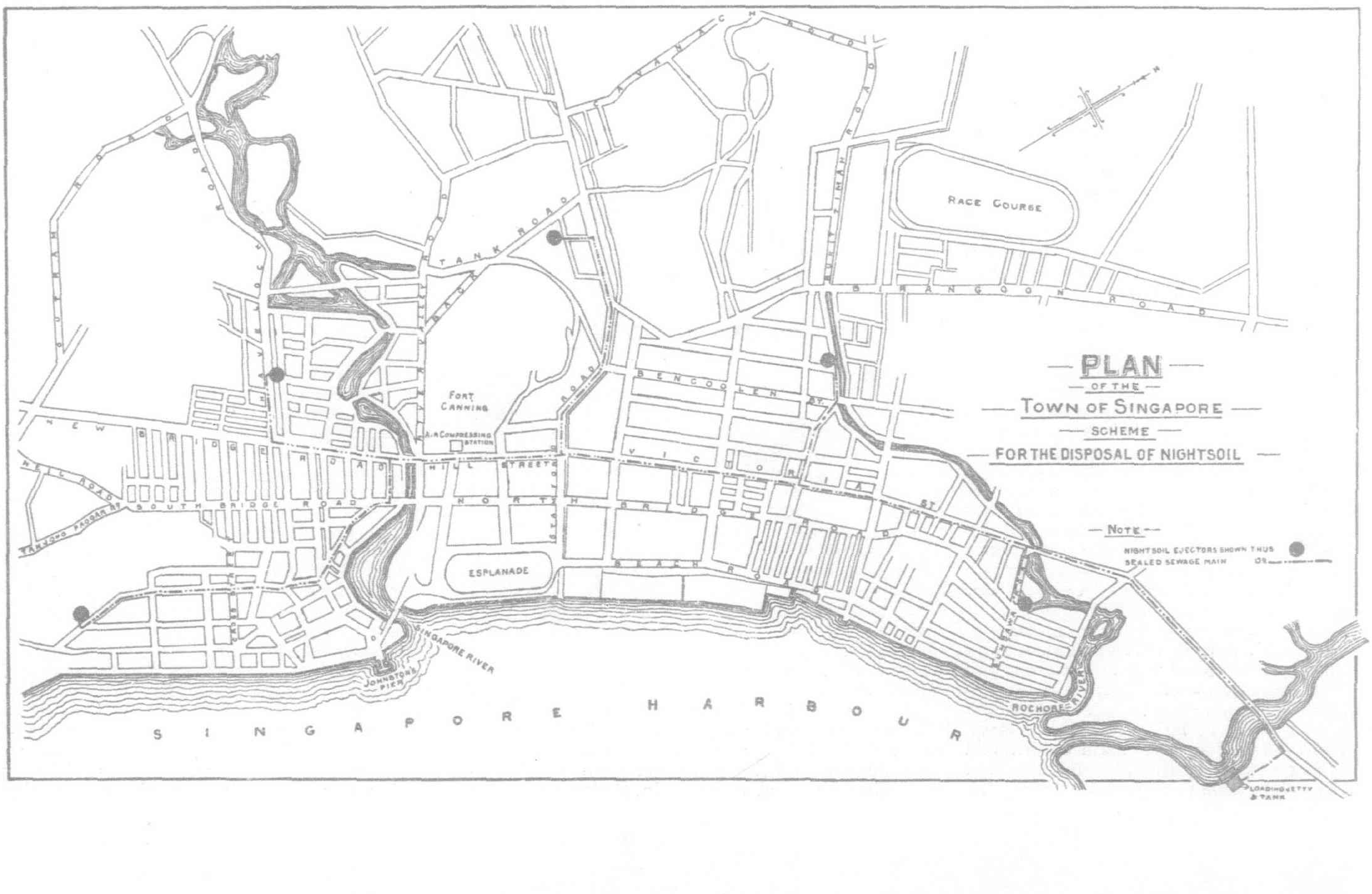
The sewers, as will be seen from the above, take only a small proportion of rainfall. It is proposed to make provision for the disposal of storm-water from the suburbs by means of surface drains to discharge into the suburban head cut. For temporary dealing with the undeveloped and poorer areas, pail depots, public latrines, and bathing platforms connected with the sewers are provided at various points of the city and suburbs. Night-soil is collected from these areas and conveyed in buckets or carts to the pail depots. Other properties have either modern fittings or various types of eastern sanitary fittings and are connected direct with the sewers. Water from the streets in which sewers exist is carried off through gullies of the usual type.

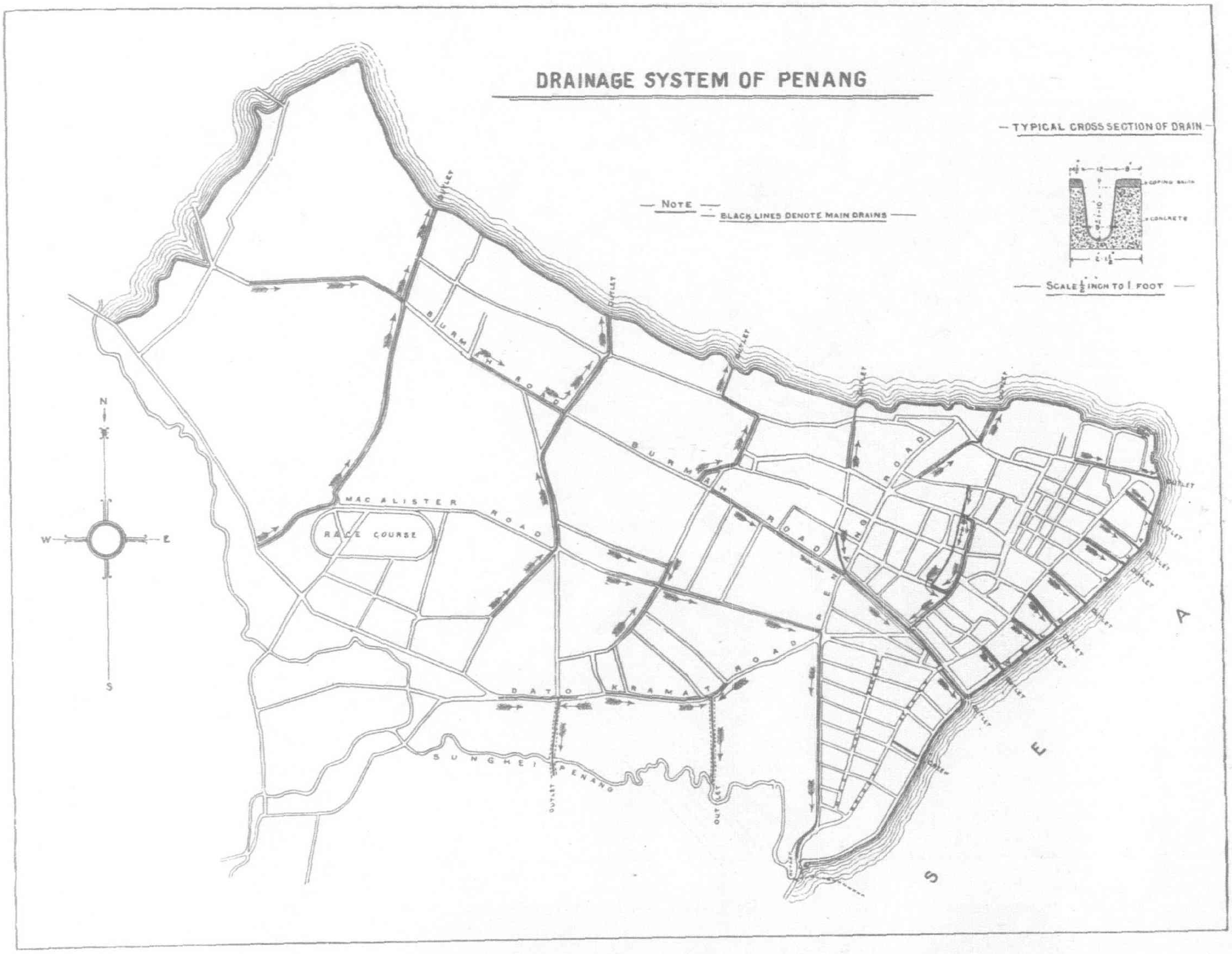
SEWERAGE OF KARACHI.— Karachi is the capital, chief port, and military headquarters of Sind, and is situated some 500 ms. to the N. of Bombay City. The population, according to the census of 1901, was 116,663, Mohamedans largely outnumbering those of any other race. Karachi has a municipality with an annual income of 12 *lakhs* of rupees.

The water supply is derived from wells which tap the subterranean beds of River Lyari, about 18 ms. from Karachi. From this source about 2,000,000 galls. of water a day are derived. The native city is drained on Shone's hydro-pneumatic ejector system, which was designed and completed in September, 1905, by Mr. James Strachan, C. I. E., then engineer of the municipality.

The area at present sewered is about 175 acres and contains, according to the census of 1901, a population of 27,128. The cost of the work amounted to Rs. 5,97,000, which is equivalent to Rs. 21-10-3 per head of population.

The subsoil of Karachi is of a sandy nature, largely impregnated with brackish water, for which reason all the ejectors are placed in chambers of cast-iron tubbing. This tubbing is made of cast-iron flag plates, 1¼″ thick, built up in sections. Access is obtained to the ejectors from the road by means of a circular cast-iron shaft, in which a wrought-iron ladder is fixed. The ejector stations are six in number and the ejectors are fixed in pairs in each station, each being capable of discharging 200 galls. These, as well as the tubbing, were supplied by Messrs. Hughes & Lancaster, of England. The sealed sewage and air mains were provided and laid by the same firm. The former were tested to maintain a pressure of 55 lbs. per sq. in. during a period of 2 hrs. The gravitating sewers, owing to the nature of the subsoil, were laid partly with cast-iron pipes and partly with glazed stoneware pipes; the former being used wherever excessive water was met with in the excavation. The gradients for the pipe sewers vary from 1 in 80 to 1 in 150. The usual manholes and flush-tank arrangements have been provided, all manholes


PLAN OF THE TOWN OF SINGAPORE SCHEME FOR THE DISPOSAL OF NIGHTSOIL



DRAINAGE SYSTEM OF PENANG

over 7′ in depth being circular in shape and built of cement concrete rings, with the exception of five joining the ejectors, which are of cement brick-work. The construction is well suited to a saturated sandy soil.

At the head of each line of gravitating sewer, there is a flush tank fitted with an automatic syphon and connected by a service pipe to the nearest water main. The flush tanks are of various capacities, from 200 galls. downwards. The sewers are ventilated on Shone and Ault's system of utilizing the exhaust air of the ejectors, which is discharged up a shaft, also connected with the sewer.

The air-compressing machinery was supplied by Messrs. Hughes & Lancaster and comprise two engines of about 25 i. h. p., each capable of compressing sufficient air to deliver 375 galls. of sewage per min. from the six ejectors. The lift, including friction, does not exceed 130′ and the actual working lift, exclusive of friction, does not exced 51′. The two boilers are of the type known as "dryback" tubular boilers, each being capable of supplying sufficient steam at 120 lbs. per sq. in. pressure to work one of the air-compressing engines. The whole sewage of Karachi is disposed of on a sewage farm.

It is proposed to extend this drainage system.

RANGOON SEWER SYSTEM.—Rangoon was the first city in the East to establish the Shone hydro-pneumatic ejector system of sewerage. It is the capital of Burma and has a population of 240,000. The water supply is derived from the Hiwaga water scheme, and is equal to 40 galls. per head of population *per diem*.

The portion of Rangoon drained on the Shone system is divided into 22 blocks; and between every two lines of houses there is a space of 15′ left for drainage purposes. In these spaces, 6″ gravitating sewers have been laid at steep inclinations, none being flatter than 1 in 200. Each block is provided with automatic ejectors, into which the sewage flows by gravitation. The ejectors, which are in duplicate, each being 200 galls. capacity, are fixed in iron tubbings at levels below the ground to suit the levels of the blocks from which they receive the sewage: and these ejectors, when full, automatically discharge the sewage into the mains through the medium of compressed air, which is supplied from the air-compressing station to small cast-iron pipes, which are connected with the ejectors by automatic valves. The mains are cast-iron pipes, varying in size from 6″ at the extreme W. of the town to 21″ from the E. of the town to the outfall near the Arracan Company's mill, the sewage being ejected into the river below low-water mark at a spot where the set of the current is against the bank at all stages of the tide. By this arrangement the sewage is immediately dissipated and does not accumulate. At the end of each drainage space is an automatic flushing tank. The flush tanks are of 200 galls. capacity and stand at the head of each gravitating sewer and can be regulated to discharge as often as necessary. Night-soil depots are now done away with.

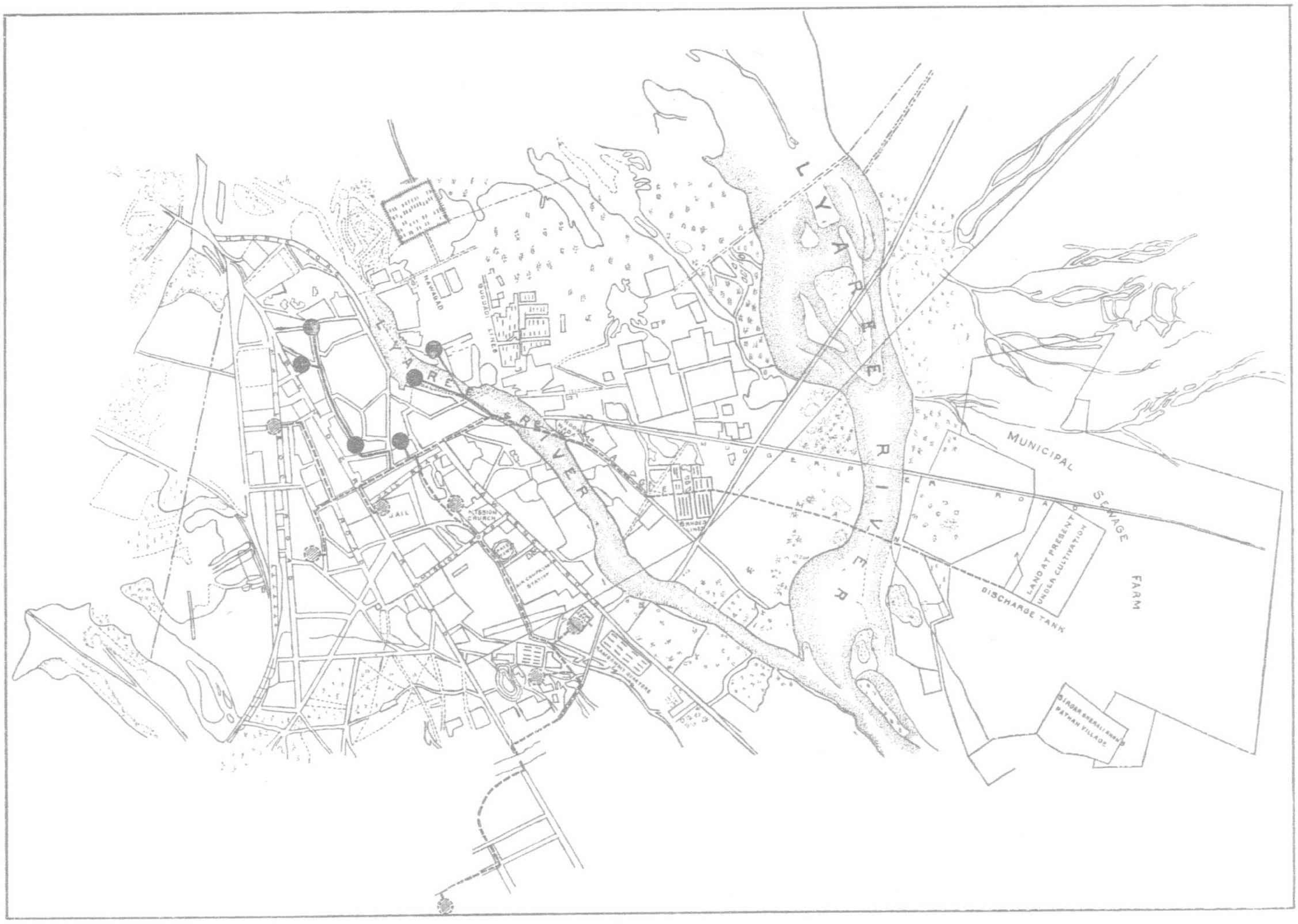
The air for working the sewage and water ejectors is compressed at a station in the E. portion of the city and is laid on to the ejectors through pipes varying in size from 2 ½″ to 10″ The air is compressed by means of triple-expansion, non-condensing engines, working at steam pressure of 150 lbs. per sq. in. above atmosphere. There are now five sets of engines but no more than three are worked together. Each set of engines has three air-compressing cylinders and the compressed air is stored in two air receivers, each being 8′ in diameter and 24′ long.

Extensive plans have been proposed for the improvement and extension of this system to meet the demands of the city's natural growth.

Sewerage of Singapore.—This city is the principal commercial center of the Straits Settlements, and consists of an island 27 ms. long by about 14 ms. broad, lying at the S. end of the Malay Peninsula. At present it has a population of about 150,000.

Singapore has no regular system of sewers. The whole of the sullage from baths and kitchens is conveyed by open roadside drains, constructed along the sides of the streets, which ultimately discharge into the tidal river and the sea at various convenient points. These drains are cleansed and swept twice a day by municipal laborers.

Early in 1904, the municipal engineer reported to the authorities that the discharge of night-soil into the sea was the most satisfactory way of dealing with the drainage problem, and that the main channel on the S. side of St. John's Island would be the most suitable position for that discharge, the currents at this place being E. and W. Taking 1½ lbs. of night-soil and urine per head per day, he estimated that 100 tons *per diem* would have to be removed. His scheme for the removal of night-soil was to divide the city into districts and to have in



DRAINAGE SYSTEM OF KARACHI

each district a Shone ejector, which would receive the excreta and then discharge it into a sealed sewer main, varying in size from 3″ to 8″ at the final landing-jetty, whence it would be discharged into barges and from them be shot into the sea. The estimated quantity of excreta to be dealt with at each receiving ejector would be 4,050 galls. or 18 tons. The total cost of the proposed scheme, exclusive of the cost of pails, was estimated at $580,710 Straits currency, and the annual working expenses at $239,008.

Sewerage of George Town, Penang.—George Town (Penang) is situated on a cape on the Island of Penang just off the W. coast of the Malay Peninsula. The site is triangular in shape, two sides being bounded by the sea and one side by the mountains which rise to a height of about 2,700′. The population of the town is about 100,000 persons, more than half of which are of various Chinese races. There is also a large proportion of Indian people and a smaller number of the original Malays. In addition to these there are representatives of practically every race in Asia and Polynesia as well as Europeans. It will thus be seen that the ideas and prejudices of a very dissimilar people must be regarded in this town. The average amount of rainfall is about 112″ and is of the usual tropical nature, the effect of which is accentuated by the close proximity of the mountains. Rainfalls at the rate of 1″ per hr. are fairly frequent and an even faster rate is not unusual.

The town is built on a flat alluvial plain with a very slight fall from the foot of the hills to the sea, a great part of the town being not more than 2 or 3′ above high-water level spring tide. The rise and fall of spring tides is about 10′, but during neap tides the water level remains practically stationary for several days at about half-tide level. In former years a large amount of flooding took place and the lower stories of European, Chinese and Indian dwellings were often flooded for days together.

As a first step to check flooding, intercepting channels were constructed across the general line of drainage, and so arranged as to intercept the flood water flowing from the suburbs towards the town and lead it by shorter routes to the sea. In forming these channels advantage was taken of a number of cross-roads constructed in embankment to form one side of the channel and divert the flood water. These channels are constructed partly in concrete and brickwork and partly in earth.

The cost of a pumping system to deal with sudden and heavy floods would be very heavy. No attempt has therefore been made to construct a self-cleansing system of sewers and the drains are of the open pattern. All closets are built outside the houses and are provided with pails. Household refuse is removed by scavenger carts.

Sewerage of Shanghai.—The international Settlement of Shanghai has an area of 8¾ sq.ms. and a population of over 11,000 whites and 450,000 Chinese, excluding the shipping population. The normal rise and fall of the tide is about 11′. The country both in the Settlement and for miles around is very flat. The rainfall averages 43.60″ *per annum*. June is preeminently the rainy month, both for frequency and abundance. The devotion of the Chinese agricultural pursuits forms the solution of the economical disposal of the ordure of the Settlement, and the Municipal Council derives a net income of about Tls. 47,770 therefrom under contract for the right of collecting night-soil in the Settlement. The system works well and the whole of the night-soil is removed daily before 9 o'clock in the morning. Owing to the numerous outlets provided by the natural creeks there are no large main outfall sewers, the largest being 3′×2.′ Tidal flap valves are not used and the tide is left free to circulate through the sewers, whose inclination, owing to the flatness of the district, rarely exceeds 1 in 500. Wherever possible, dead ends are avoided in order that the tidal water may circulate through the various systems. The majority of the roads, of which there are 87 ms., are macadamized, and consequently a large amount of detritus finds its way to the street gullies, which are also emptied periodically. Rigid supervision is maintained over all private drainage works.

Owing to the difficulty of obtaining stoneware pipes at a reasonable cost, the council manufactures its own pipes of concrete. They are made of the usual pattern in 2′ lengths with spigot and socked joints. Other pipes of standard sizes are also manufactured.

The water supply of the Settlement is in the hands of the Shanghai Waterworks Company, Ltd., and the supply is drawn from the Whangpoo River, about 2 ms. below town. The water is drawn off at high tide and goes through a process of settling tanks and filters of sand. The quality of the water is excellent.

BENARES, LUCKNOW AND MIRZAPUR, INDIA.—Benares has a population of about 208,000 and is expending Rs. 34,00,000 for the construction of its sewer system. Lucknow has a population of nearly 300,000, and is spending Rs. 20,00,000 for its sewerage. The sewerage works of Mirzapur are nearing completion and are estimated to cost Rs.2.25,000. The town has a population of 56,000.

BIDS ON LOCOMOTIVES, BANGKOK

Bids to supply the railways of Siam with nine passenger and seven freight locomotives, with spare parts for same, were opened recently by Director-General Weiler, of the Royal Siamese Railway Department, at Bangkok. The tenders, in each case being the price per unit, were as follows:—

Orenstein and Koppel, Berlin.—Passenger £2,020, total with spare parts £24,989 17s.; freight £2,435, total with spare parts £23,375 16s. Grand total £48,364 13s.

John Cockerill, Ltd., Seraing, Belgium.—Passenger £1,976, total with spare parts £24,292 16s.; freight £2.149, total with spare parts £22,361 8s. Grand total £46,654 4s.

Krauss & Co., Munich.—Freight £2,900, boiler tubes only £8,500. Grand total £28,800.

Baldwin Locomotive Works, Philadelphia (per Sanders & Co., London)—Passenger £1,960, total with spare parts £24,489 18s; freight £2,370, total with spare parts £23,121 14s Grand total £47,611 12s.

J. A. Maffei, Munich.—Passenger £2,215, total with spare parts £27,235; freight £2 555, total with spare parts £24,715. Grand total £57,950.

Richard Hartmann Works, Chemnitz (per A. Markwald & Co., Ltd.).—Passenger £2,120, total with spare parts £26,480; freight £2,160, total with spare parts £25,670. Grand total £52,150.

Compagnie de Fives-Lille, Paris.—Passenger £2,780, total with spare parts £34,102 16s; freight £3,320, total with spare parts £31 252 4s. Grand total £65,355.

Schweizerische Lokomotiv und Maschinen Fabrik, Winterthur.—Passenger £2,420, freight £3,000. (Spare parts were quoted for in detail but the totals were not given.)

Andrew Barclay, Sons & Co., Ltd., Caledonia Works, Kilmarnock.—Passenger £3,062, total with spare parts £37,924 15s; freight £3,858, total with spare parts £36,257 18s. Grand total £74,181 13s.

Berliner Maschinen A. G., vormalls L. Schwartzkopff, Berlin.—Passenger £2,100, total with spare parts £26,145; freight £3,858, total with spare parts £25,000. Grand total £51,145.

Bolling & Lowe, London.—Passenger £2,300, total with spare parts £28,612 16s; freight £3,050, total with spare parts £28,897 8s. Grand total £57,510 4s.

Maschinenbau Anstalt "Humboldt" Köln.—Passenger £2,300, total with spare parts £27,913 6s; freight £2,740, total with spare parts £25,982 19s. Grand total £53,896 5s.

Vegn ach Masken Fabriks Aktiebolaget, Stockholm.—Passenger £2,650, total £23,850; freight £3,500; total £24,500. Grand total £48,350. (Spare parts not bid for.)

Boyne Engine Works, Leeds.—Passenger £2,575, total with spare parts £35,081 11s; freight £3,330, total with spare parts £32,960 3s Grand total £68,041 14s. (Prices without freight, f. o. b. Birkenhead.)

Hannoversche Maschinenbau A. G. vormalls Georg Egestorff Hannover-Linden.—Passenger £1,980, total with spare parts £24,840; freight £2,620, total with spare parts £25,130. Grand total £49,970.

Beyer, Peacock & Co., Manchester—Passenger £2,675, total with spare parts £35,523; freight £3,250, total with spare parts £33,281 10s. Grand total £68,804 10s.

Zeitz & Co., London, for Stettiner Maschinenbau A. G., Vulcan, Stettin.—Passenger £2.600, total with spare parts £31,940; freight £3,200, total with spare parts £30,820. Grand total £62,760.

American Locomotive Company, New York.—Passenger £2,053 7s. 9d., total with spare parts £24,591 4s. 9d.; freight £2,176 11s. 10d., total with spare parts £20,221 9s. 8d. Grand total £44.812 14s. 5d.

Oesterreich Staats Eisenbahn Ges., Vienna.—Freight £2 860, total with spare parts £27,220.

A. Borsing Tegel. Berlin.—Passenger £2,055, total with spare parts £25,879; freight £2,650, total with spare parts £25,361. Grand total £51.240.

Nederlandsche Fabriek van Werktuigen en Spoorweg-materieel, Amsterdam.—Freight £2,046, total with spare parts £28,013 10s. 8d.

Henschel & Sohn, Cassel.—Passenger £2,040, total with spare parts £25,590 10s. 6d.; freight £2,490, total with spare parts £23,989 9s. 4d. Grand total £49,579 19s. 10d.

Nasmyth, Wilson, & Co., Bridgewater Foundry, near Manchester.—Passenger £2,757, total with spare parts £33,372; freight £3,095, total with spare parts £30,663 12s. Grand total £64,035 10s.

La Metallurgique S. A., Brussels—Passenger £2,300, total with spare parts £28,612 16s.; freight £3,050, total with spare parts £28,897 8s. Grand total £57 510 4s.

Hohenzollern A. G. für Lokomotivbau, Düsseldorf.—Passenger £2 250, total with spare parts £26,896 10s, freight £2,560, total with spare parts £23,835. Grand total £50.731 10s.

Robert Stephenson & Co, Ltd., Darlington.—Passenger £2,455, total with spare parts £33,030; freight £2,735, total with spare parts £28,421 15s. Grand total £61,451 15s.

Nydqvist & Holm, Trolhättan, Sweden.—Passenger £2,[illegible]11 2s. 2d., total with spare parts £25,829 1s. 11d.; freight £2,859 8s. 11d., total with spare parts £23,718 14s. Grand total £49,547 15s. 11d. (Freight for locomotives included, but not for spare parts.)

Aktien Gesellschaft der Lokomotivfabrik vorm. G. Sigl, in Wiener-Neustadt.—Passenger £2,270, total with spare parts £27,937 12s. 2d.; freight £2,800, total with spare parts $26,586 18s. 7d. Grand total £54,524 18s. 7d.

Dutilh, Smith, McMillan & Co., London.—Passenger £2,380, total with spare parts £28,471 10s.; freight £2,884, total with spare parts £26,861 16s. Grand total £55,333, 6s. (Submitted by Bombay-Burmah Trading Corporation, Ltd.)

S. A. Franco-Belge, à la Croyère, Belgium.—Passenger £2,510, total with spare parts £32,222 0s. 6d.; freight £2,956 10s., total with spare parts £28,956 7s. 6d. Grand total £61,178 8s. (Submitted by Clarke & Co., Bangkok).

S. A. Saint Léonard, Liège.—Passenger £2,280, total with spare parts £27,820; freight £2,620, total with spare parts £26,540. Grand total £54,360. (Submitted by G. Kluzer & Co., Bangkok).

Wiener Lokomotivfabrik A. G., Vienna.—Passenger £2.400, total with spare parts £29.660.

S. A. des Forges, Usines et Fonderies de Haine St. Pierre.—Passenger £2.310, total with spare parts £27,628 4s.; freight £2,800, total with spare parts £26,045 12s. Grand total £53,673 16s. (In a covering letter this company said that the two totals could be reduced to £26,523 1s. 5d. and £25,003 15s. 6d respectively, making a grand total of £51.526 16s. 11d.)

Howarth Erskine, Ltd., Bangkok.—Passenger £2,451 8s., total with spare parts £29,3[illegible]6 9s. 5d.; freight £2,570 10s. 4d., total with spare parts £27,667 15s. 2d. Grand total £56,994 4s. 8d.

PUBLIC WORKS PROGRAM FOR 1907, HONGKONG

At a recent meeting of the Legislative Council of Hongkong, Sir Matthew Nathan, Colonial Governor, dealt at length on the colonial estimates for 1907. With reference to public works for the coming year he said.—

In the Public Works Department the decrease of $30,620 is due to higher exchange on salaries and the increase of $7,750 is due to automatic changes and the operation of the gradient scheme. Building overseers' salaries have been raised to bring them in line with sanitary inspectors. The further increase of $88 is for minor alterations in conveyance and allowance. The net decrease in the public works is $21,986. In public works recurrent the increase of $4,000 is for the maintenance of buildings and $9,000 is for the maintenance of roads, $4,000 is for the maintenance of water works. The new item put in of $12,500 is for typhoon damages. That amount is based on the average spent on repairs on damage caused in past years. Hitherto it has been customary to make a special vote, but it is more satisfactory to include the item in the estimates. The decrease of $10,000 under public works recurrent is for the maintenance of lighting. This is due to a reduction in the price of gas which we succeeded in obtaining from the gas company. The net increase on public works recurrent is $28,300. In public works extraordinary, whereas for buildings in 1906 we inserted $480,100 we have inserted only $381,500 in the estimates for 1907, or nearly $100,000 less. First of all we have completed a certain number of buildings in the current year. These are the harbor office, the western market, the Mongkok Tsui Market, the Shanghai Postoffice and five small buildings. I do not propose to go on with the prison at the present time. It appeared to be a very urgent necessity 2 yrs. ago when we hardly knew what to do with prisoners, but fortunately the number is so much reduced that we are not only not overcrowded but enabled to close the branch prison. In these circumstances the necessity for an additional prison can be reasonably cut out from the estimates. We have in the estimates some amounts for proceeding with the Supreme Court and Postoffice. The amount we considered we could effectually spend in pushing on the work as much as possible. Then we have had to include amounts for certain buildings already in progress or for which contracts are let. The estimate for the latrines, urinals, time-ball station at Kowloon, Postoffice at Wanchai and the Kowloon Mortuary next year is $21,500. Then there are two new buildings and it is proposed to put only these two in hand. One is the land office at Tai Po. This is absolutely necessary in order to prevent the risk of destruction of all land records pertaining to the new territories, and the estimated cost is $15,000. Then it is proposed to erect a market at Quarry Bay, the estimated cost of which is also $15,000. This was recommended by the Sanitary Board. The continuation of the Supreme Court and the postoffice, with these two buildings, bring the vote up to $381,500. For communications last year we estimated $216,800. This year we included in the estimate for communications two items in connection with the railway amounting to $100,000 which will eventually be repaid to the revenue from the railway. The Government also estimated for the completion of Conduit-rd but it is not possible to quite complete that with the amount inserted in the present year's estimates, which is comparatively small to what was inserted last year. We have still got the item for extending Robinson-rd, Kowloon, and an item for roads in the new territories, and we have slightly increased the item for forming aand curbing streets as additional buildings required that the streets should be ready for them. Drainage for which last year you voted $70,000 is estimated this year at $80,000, $10,000 having been added for miscellaneous drainage works the amount at present in the estimates not having proved sufficient. For the extending of lighting there is a small amount of $2,500 inserted. Miscellaneous is $90,100, $70,600 of which stood in the estimates for 1906. Of this, $20,000 is for a permanent shelter for Blake Pier. In the original grant it was also proposed to renew the Queen's Statue Pier, but we will have to let that remain for another year. In the meantime Blake Pier will be improved in accordance with my promise to the council sometime ago. The other items are small ones which I intend to discuss in detail. There is $5,000 for the renewal of the survey of the marks in the New Territory. This is necessary as otherwise the survey would be lost and we would have difficulties in connection with laying out the line. $22,000 is for concreting piers and the existing work has already commenced. $9,000 is for reclaiming the Taipo fish pond as intended to prevent what we believe will be an important place in the future from getting into an unsatisfactory state at the commencement. Under the *Public Health and Buildings Ordinance* I have estimated only $20,000 as against $160,000 this year. $20,000 is entirely for compensation we have to pay under the provisions of the ordinance. No amount has been included this year for the resumption of insanitary property for which $150,000 was included last year. In waterworks provision has been made for $536,600 and $286,300 of this amount is required for the completion of the Kowloon gravitation scheme, and the Tytam Tuk first section. The remaining $200,000 is for starting the Tytam Tuk second section in accordance with my promise to the council.

Program of Extraordinary Works.

The program of public works extraordinary is detailed in the estimates as below. Against each item is the amount provided to be expended in 1907.

1	Law courts........$	160,000
2	Postoffice........	160,000
3	Public latrines and urinals........	12,000
4	Mortuary at Kowloon........	7,500
5	Time-ball tower on Blackhead's Hill, Kowloon........	6,000
6	Branch postoffice at Wanchai........	6,000
7	Landoffice at Tai Po........	15,000
8	Market near Quarry Bay........	15,000
	Communications.	
9	New roads in Victoria, Extension E. and W. of Conduit-rd........	14,000
10	New roads in Kowloon........	30,000
11	New road in new territories........	15,000
12	Forming and Kerbing-st........	40,000
	Drainage.	
13	Gullies reconstruction........	10,000
14	Training nullahs........	20,000
15	Large flushing tanks for main sewers and substitution of iron for earthenware pipes........	5,000
16	Miscellaneous drainage works........	45,000
	Lighting.	
17	Extension of gas lighting........	2,500
	Miscellaneous.	
18	Permanent marks for traverse survey points in new territories........	5,000
19	Reinforced concrete piers at Green Island gunpowder depot, new harbor office and Kowloon City........	22,000
20	Blake Pier shelter........	20,000
21	Resuming and filling in fish pond at Tai Po........	9,000
22	Miscellaneous works........	35,000
23	Store account........	100
	Public Health and Buildings Ordinance, 1903.	
24	Compensation........	20,000
	Waterworks.	
25	Albany filter beds, reconstruction and extension........	30,000
26	Kowloon water works, gravitation scheme........	256,600
27	Tytam Tuk scheme, first section........	30,000
28	Tytam Tuk scheme, second section........	200,000
29	Miscellaneous waterwoks........	20,000
	Total public woks, extraordinary........$	1,210,700

PHILIPPINE CONTRACTS

The director of the Bureau of Supplies, Manila, has awarded the following contracts for the Philippine Government:—

To Frank L. Strong, Manila, 30,000 lbs. blue vitriol @ ₱0.174 per lb., and 10,000 glass insulators @ ₱0.082 each; to Grant & Company, Ltd., Manila, 5,000 coppers for battery @ ₱0.0868 each, 1,000 lbs. salmonia @ ₱0.18 per lb., 500 signal service brackets @ ₱1.5728 each, 100 ms. telephone wire No. 14 @ ₱7.86 per mi., 48 ring coils @ ₱0.98 each, 12 telephone coils @ ₱1.54 each, 1,000 "Gonda" prisms @ ₱0.5624 each; to H. W. Peabody & Co., 10,000 wooden insulator brackets @ ₱0.0595 each, 2,000 telephone iron poles @ ₱5.60 each, 100 lightning arresters @ ₱1.28 each, 5,000 zincs (crowfoot) @ ₱0.40 each, 2,000 zinc pencils @ ₱0.0525 each, caps "Gonda" cells @ ₱0.13 each, 25 induction coils @ ₱0.73 each, 100 binding posts @ ₱0.1275 each.

Sealed proposals will be received by the Chief Quartermaster, Department of Luzon, at Fort McKinley, Rizal, P. I., on November 1st, for furnishing and delivering and putting in place two steel tanks and trestles and altering one steel tank.

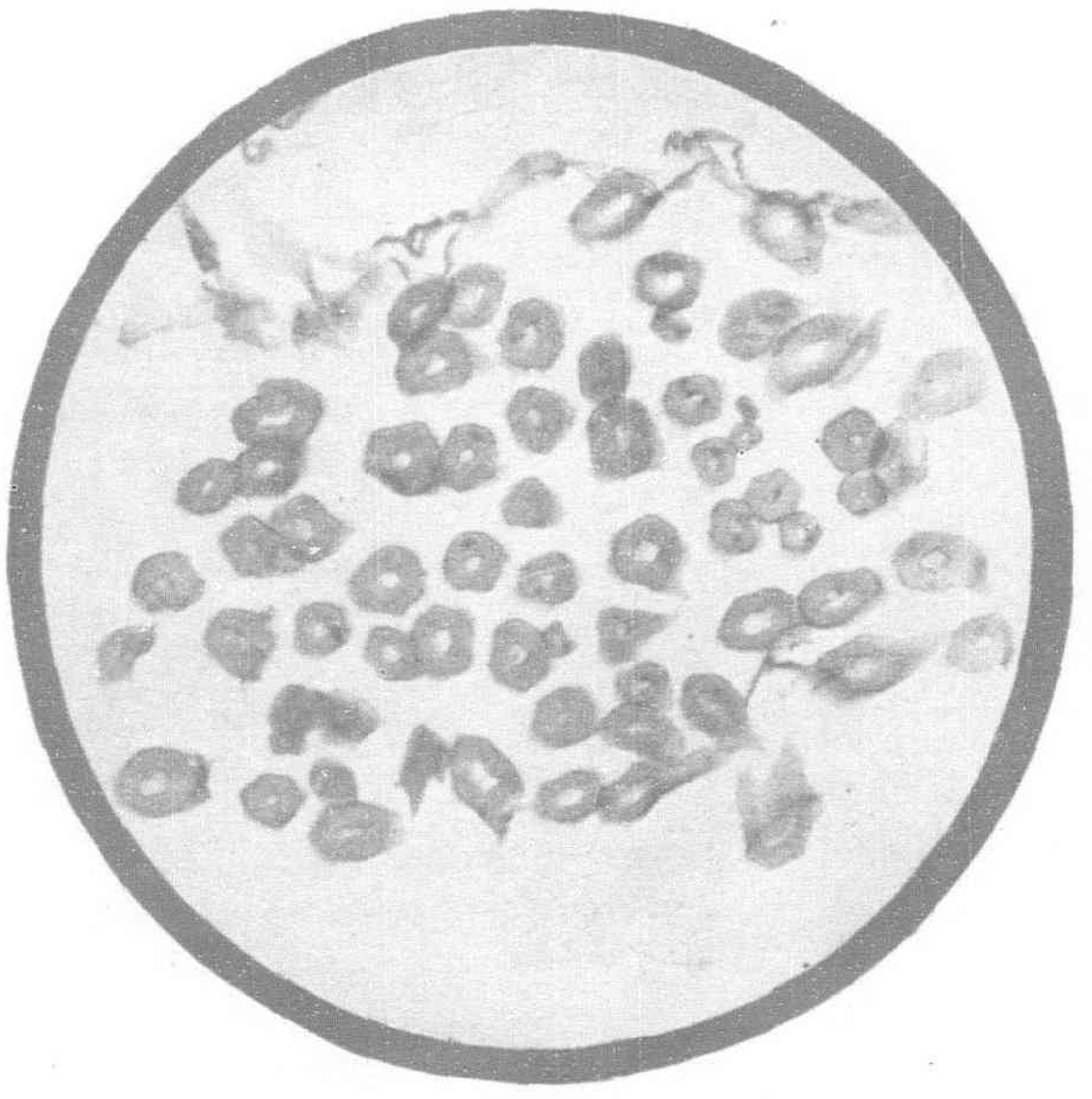
SOME PHILIPPINE FIBERS AND FIBROUS SUBSTANCES: THEIR SUITABILITY FOR PAPER MAKING

Condensation of an Article in "The Philippine Journal of Science," by Mr. George Richmond, Government Chemist, Bureau of Science, Manila.

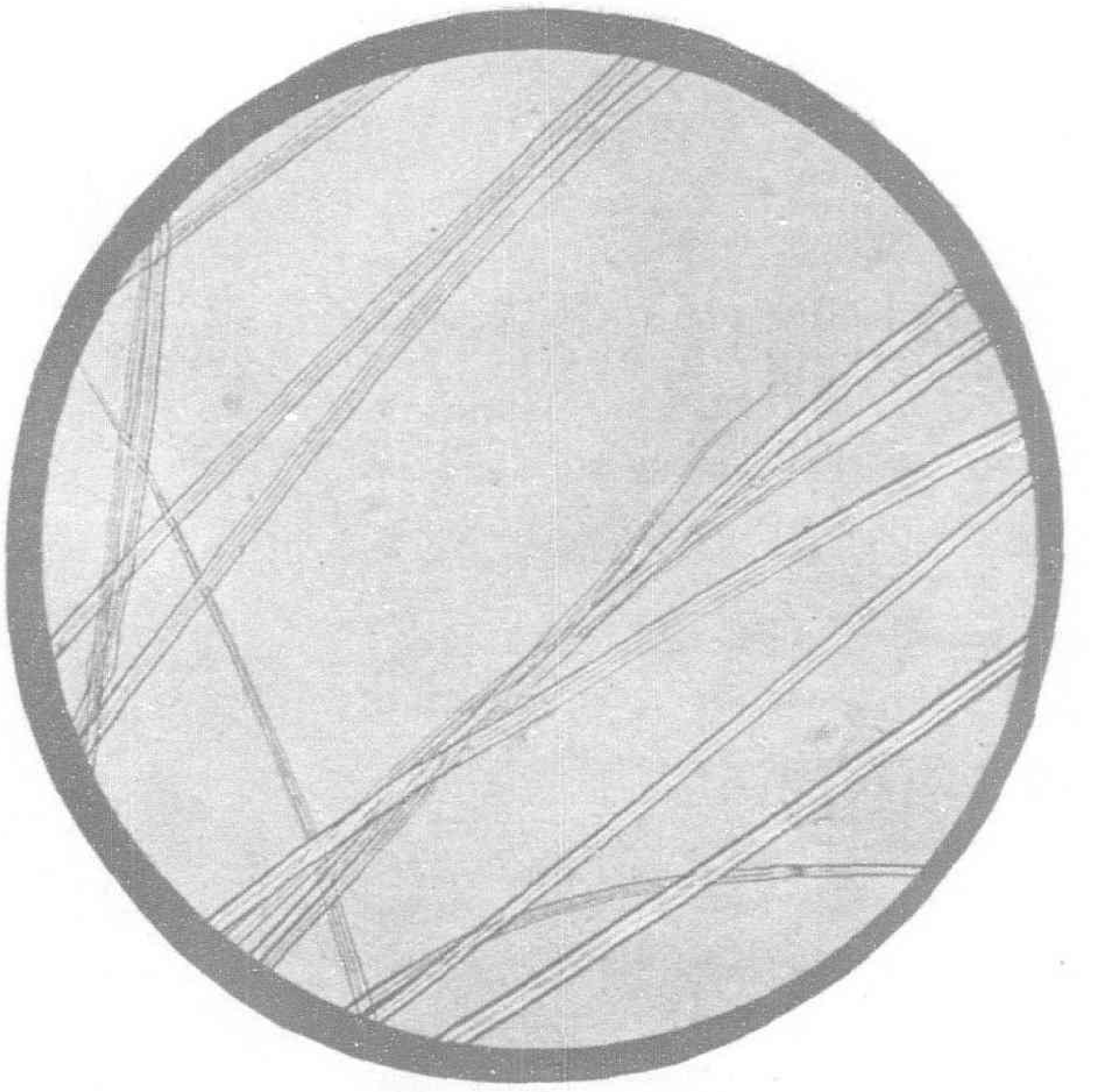
[EXPLANATORY NOTE.—Samples of handmade paper manufactured at the Bureau of Science from abacá waste and cogon grass accompany this article. They were furnished to the REVIEW by Dr. Paul C. Freer, M. D., Ph. D., director of the bureau. Similar specimen sheets made from banana, bamboo, palms and other material will be furnished by the director on request. In the manufacture of this paper it was thought best not to alter the pulp in any way, but only to provide pure bleached specimens, thus affording paper manufacturers and others who are interested an opportunity for testing the fiber to their own satisfaction. Consequently, no attempt at loading, sizing, coloring, or calendering the specimens was made. The work required to turn out several reams of handmade paper with apparatus available at the laboratory is very great, and it was practically all performed by Filipinos. Director Freer thinks this speaks favorably for their skill in acquiring facility in manipulations of this kind.—EDITOR.]

In looking over the field in the Philippine Islands for suitable material for the purposes of studying the utility of fibers and fibrous substances for paper making, Mr. Richmond's attention was first directed to abacá, or Manila hemp. This plant is a species of wild banana of which there are several indigenous to, or introduced into, the Philippine Islands, and, as is well-known, so-called Manila paper has long been made from wornout ropes of this fiber. Its superior quality for the manufacture of special kinds of paper where strength is the desideratum is well demonstrated.

According to the 12th report of the United States Census, American paper manufacturers purchased approximately 100,000 tons of so-called Manila stock for use in their mills; the approximate cost was $2,500,000 gold, or $25 per ton. This stock was made up of old, wornout rope, gunny sacks, waste thread, and binder twine, and it includes jute butts and waste. Rags, which the world over are considered to be the finest material for paper making, do not command a much greater price. In the same census year (1900' 234,000 tons of rags valued at $6,600,000 gold, equal to about $28 per ton, were used. Statistics also show an annual output of 90,000 tons of Manila wrapping paper valued at $66 gold per ton and 204,000 tons of "bogus" Manila paper made from wood, rated at $9,150,000 gold, or $45 per ton. A large proportion of the so-called Manila wrappers, paper and envelopes contain mechanical of ground wood, which causes such articles to deteriorate and to turn brown with age. Mr. Richmond says:—



TRANSVERSE SECTION OF ABACÁ FIBERS



ABACÁ FIBERS SEEN LONGITUDINALLY

Abacá waste.—It has been observed for a long time that much fiber is lost in the ordinary hand processes for isolating the cordage fiber from this plant, and, in 1887, some of this waste from abacá was sent to Messrs. Gonzales Sons, of Barcelona, Spain, who reported as follows:—

> Observations made in the course of fabrication permit us to affirm roundly that abacá waste as raw material for the manufacture of paper is not only utilizable but surpasses esparto and hemp. and, in its treatmen for conversion into paper, excels rags and other material known in the industry.

In 1904, a quantity of abacá waste was sent to the Everett Pulp and Paper Company, of Everett, Washington, U. S. A., for further opinion as to its adaptability for paper manufacture. The chemist's report follows:—

> The waste as received was very dirty, and could not be used in the way we now treat our wood, but would have to be passed through a duster or "Devil," such as is used for very dirty rags, oakum, rope, etc. It may be possible in collecting this material to avoid a large part of this dirt.
>
> The waste was submitted to the same process as the wood now being used, except the caustic-soda solution was one half the strength, the time of digesting four and one-half hours, the pressure 100 pounds, and 325° Fahrenheit temperature.
>
> The cooking was done by indirect steam—that is, the heat was produced by a steam coil in the digester, and not direct steam as we use it.
>
> The fiber reduces very easily, and, after being washed in hot water, bleaches to color of sample, with the same amount of bleaching powder as required by the wood pulp.
>
> The loss in the process from the dry, crude material to the dry, bleached pulp is 64 per cent, or, the crude material will produce 36 per cent by weight of fiber ready for the beater.
>
> Under the microscope the fibers are long, slender, and smooth, tapering to a point at the ends; some have small hairs on the sides.
>
> The bleached fiber contained 6 8 per cent ash, while wood fiber has less than 2 per cent and in most instances when well cooked has only 0.3 per cent
>
> This, however, does not detract from the value as a paper-making material.
>
> Owing to the small amount of material received, it has been impossible for me to try any experiments along the line of obtaining the same results by the use of cheaper chemicals. It might be possible to do the work with a solution of lime, the same as straw is treated.
>
> In my opinion this abacá waste can be reduced to a fine, silky fiber, suitable for the best of paper, making a sheet equal to the best linen, or without being bleached, made into a light-gray wrapping paper, which would excel in strength any paper on the market.

In the meantime, the Bureau of Agriculture of the Philippine Islands conducted a series of experiments in stripping abacá by the customary hand process for the purpose of determining the relative amounts of dry cordage fiber saved and dry fibrous waste lost:—

Weight.	S. Ramon. Mindanao	Paete, laguna.
Weight of green stalk..........kilos...	9.525	15.876
Weight of green fiber...........do.....	.4536	.680
Weight of dry fiber. ....do.....	.163	.2268
Weight of green fibrous waste..do.....	1.814	2.494
Weight of dry fibrous waste....do.....	.1769	.199
Percentage of dry waste in stalk.......	1.85	1.25
Percentage of dry fiber in stalk........	.	1.43

The importance of the above data because they seriously influence our judgment of the supply of this waste material, justifies their repetition, particularly as we also subsequently desired to learn the effect of machine stripping on stalks under the same conditions. The following table gives a comparison between the hand and machine stripping processes; the stalks used were from Paete, Laguna, and had been harvested about two weeks before the tests were made. The results are averaged from 10 stalks:—

Weight.	Hand stripped.	Machine stripped.
Green stalk ....kilos..	15.876	13.984
Green fiber....................do....	.317	.199
Dry fiber......................do....	.159	1147
Green fibrous waste..........do....	.273	....
Dry fibrous waste...........do....	.199	.635
Percentage of dry waste per stalk.	1.25	4.54
Percentage of dry fiber per stalk.	1.00	.821

Explanation of results.—In order to explain the data recorded in the above table it is necessary to describe the manner in which the stalks were prepared for the two methods of treatment. For the hand stripping, about one foot of each end of the stalks was chopped off to facilitate the removal of the petioles, and three or four of the outer ones, which were bruised and discolored, were also discarded. Then, two or more ribbon-like strips were peeled from the entire length of the outer surface of each layer of the remaining portion of the stalk. Only these thin, fibrous ribbons were subjected to the stripping process. All the cellular portions of each petiole, together with the outer sheathes and the cut ends, were discarded. These constitute a class of waste distinct from that which results from the stripping operation itself. For reasons which will appear later, this waste is designated as *semifibrous* in distinction from the genuine *fibrous* material collected under the stripping knife.

In the case of the machine-stripped fiber, the stalks were prepared by first removing the ends and outer petioles, as in the method mentioned above, but the remainder was cut lengthwise into sections of the requisite width and then fed directly into the machine, without any attempt being made at the separation of the fibrous from the cellular portions. Hence, the 635 grams of dry waste which remained represented the quantity produced by the actual stripping process and must directly be compared with the 199 grams of dry, fibrous waste obtained by the other method. The machine removed so much water from the waste that its weight in a green state would have afforded no value for comparison; therefore it was not determined.

The machine employed for this test was still in an experimental stage, hence the results obtained do not afford reliable data as to the possible effect of machine stripping on the future supply of abacá fiber and waste, but it was the only opportunity which has thus far presented itself for obtaining even approximate information in regard to this question. This machine waste contains a large amount of fiber of value to the paper maker and the quantity of waste demonstrates the fact that, whereas the outer surface of the leaf petioles undoubtedly contains the strongest fibers which are so valuable to the cordage maker, the cellular portion of the petioles also contains much fiber which is entirely lost by the hand-stripping process.

Semi-fibrous waste.—No determination of the percentage of the semi-fibrous waste, above referred to, was made at the time the stripping experiments were conducted. Later, an approximate determination of the amount produced by a given stalk was arrived at in the following manner:—A complete stalk of abacá, weighing 15 876 kilos, was chopped into small pieces and subjected to hydraulic pressure. The dried residue weighed 1.592 kilos, so that the original stalks contained 10 per cent of vegetable matter and 90 per cent of water, calculated on the gross weight. In the case of the hand-stripped stalks only 2¼ per cent of these solids is accounted for. This loss of nearly 80 per cent, or four-fifths of the total solids of the stalk, caused us to collect and dry some of this waste material for a determination of its cellulose content. These and all subsequent digestion experiments were conducted on 1-kilo lots of dry material.

Experiment No. 1.—Strength of the caustic soda liquors, 2 per cent; 15 per cent of caustic soda calculated on dry weight of material treated; pressure, 6-8 atmospheres; time, 8 hours; yield 33 per cent; digestion, incomplete; residue, brown and coarse and only fit for cheap, colored wrappings.

Experiment No. 2—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on dry weight of material; pressure, 6-8 atmospheres; time, 8 hours; yield, 20.5 per cent; apparently well digested; light-gray residue.

Experiment. No. 3—Strength of liquor, 5 per cent; 45.5 per cent caustic soda calculated on dry weight of material; other conditions same as above; yield, 20 per cent.

From the above results we see that this waste is semi-fibrous. The time required, the pressure, and the strength of the caustic soda necessary to remove the cellulose portions of this waste will undoubtedly prohibit its use. No further experimentation with this material was made. For the manufacture of wrapping paper, where color is not so important as is strength and cheapness, the waste could be lime-boiled under pressure, and but partially bleached, as is done with jute.

Fibrous waste.—The waste material, which results from the present method of extraction of the fiber for cordage and textile purposes, consists essentially of broken, tangled, but clean, fibers mixed with strips or bands of fiber aggregates, from which the cellular and incrusting matter has not entirely been removed. Its cellulose content varies, being of course dependent upon the amount of these soluble constituents which are present. The readiness with which it is reduced to the condition of paper pulp, the kind and strength of chemicals required, and the time necessary for proper digestion likewise depend on this same factor. The fibrous waste was prepared for experimentation in much the same manner as old rope or rags are treated—namely, it was cut by hand into short pieces, thoroughly cleaned from all adhering sand and dirt and digested with caustic-soda liquor at elevated temperatures. The residues were drained and washed with hot water until they were free from alkali and the washings were colorless; they were then dried to constant weight in a water-jacketed air bath.

Experiment No. 1—Strength of liquor, 2 per cent; 17 per cent caustic soda calculated on weight of material digested, pressure, 6-8 atmospheres; time, 4½ hours; yield, 36.65 per cent; residue, brown gray in color, not entirely free from cellular matter.

Experiment No. 2—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on weight of material; pressure, 6-7 atmospheres; time, 4½ hours; yield, 32.84 per cent; well-cooked pulp of a light-gray color.

Experiment No. 3—Strength of liquor, 3¾ per cent; 30 per cent caustic soda calculated on weight of material; pressure, 6-7 atmospheres, time; 5 hours; yield, 31.7 per cent.

Experiment No. 4—Strength of liquor, 3⅜ per cent; 40 per cent caustic soda; other conditions same as No. 3; yield, 31 64 per cent.

Experiment No. 5—Five per cent liquor; 45½ per cent caustic soda; other conditions same as above; yield, 31.51 per cent.

The waste employed in the above experiments was obtained from a machine-stripping process. Reference to the table shows the relatively high percentage of dry machine waste as compared with the hand-stripped article. This explains the low cellulose content obtained. The experiments bring out the following points:—

First, Two per cent liquor is insufficient with the pressure and time employed.

Second. Three and three-fourths per cent liquor is as efficient as the stronger concentrations.

Third. The gradual but constant lowering of the yield in experiments 3, 4, and 5 is due to the fact that the stronger liquors attack the cellulose, but pressures of 6-7 atmospheres may safely be employed because, under these conditions, the solvent action is very slight.

The conditions of time, pressure, and strength of caustic soda which give the best results are approximately one-half of those employed in the manufacture of wood pulp by the soda process.

A second series of five digestions was made on abacá waste resulting from the hand process of extracting the fiber. The preliminary preparation of the material was the same as in the preceding experiments. In each case a 3⅛ per cent caustic soda solution was employed, 25 per cent caustic calculated on the weight of the material digested. The pressure was held for five hours at 6 atmospheres as a minimum and 7 atmospheres as a maximum. The yields were 38.89, 41.69, 42.59, 42.66, and 42.14 per cent, respectively. The resulting pulps were of a light-gray color and devoid of the harsh feel which comes from insufficient cooking.

For purposes of comparison, two specimens of old Manila rope, representing the extremes of quality of such material for paper manufacture, were examined.

Preliminary treatment.—The pieces of rope were cut down and thoroughly cleaned and dusted as is the practice in mills where such material is used.

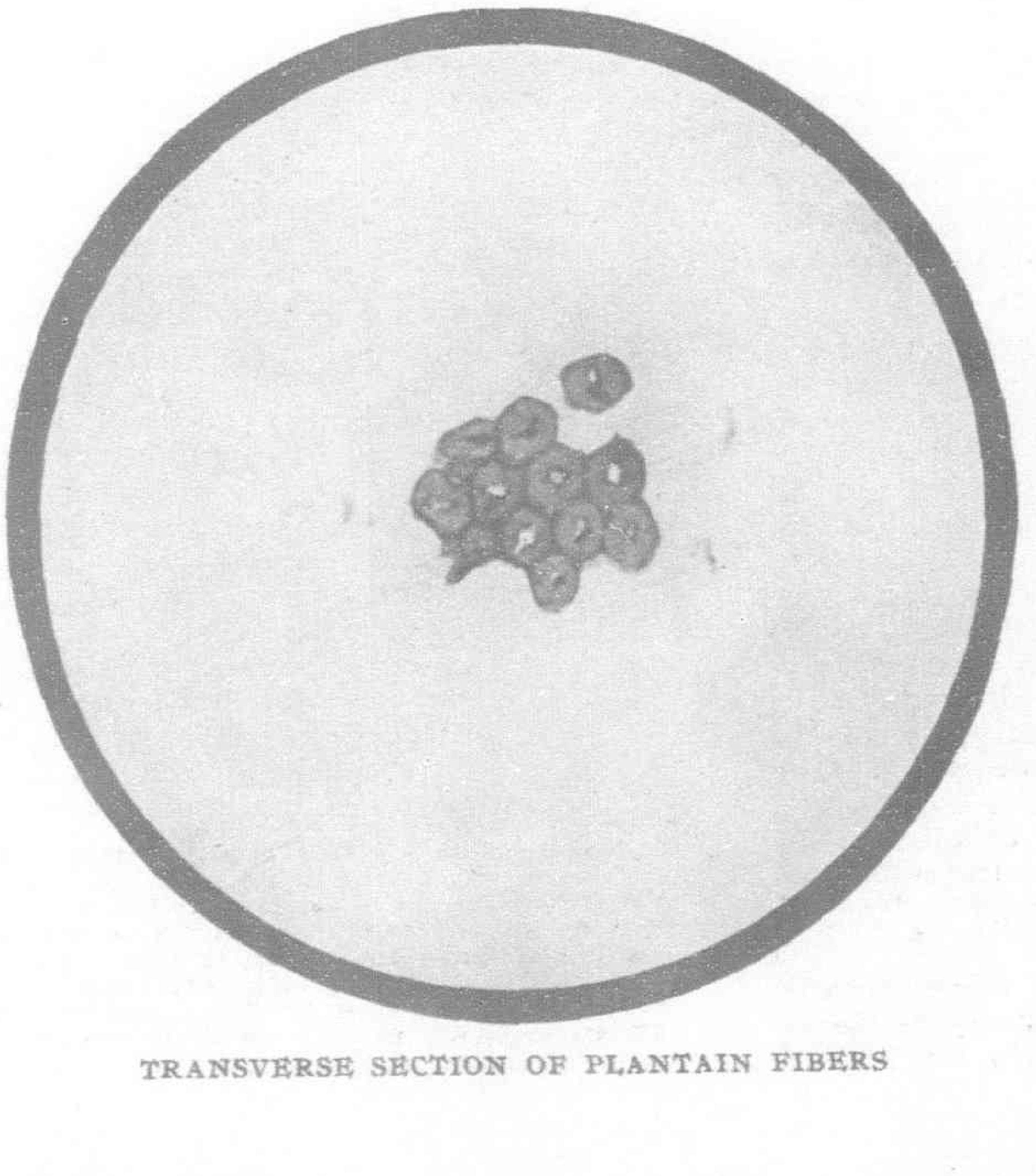
Specimen No. 1.—A good grade of 1-inch rope but badly frayed and worn; lost 21 per cent in cleaning.

Experiment No. 1—Strength of liquor, 3⅛ per cent; 25 per cent caustic soda calculated on weight of material digested; boiled 5 hours, at 6-8 atmospheres; yield, 61 per cent, equal to 48 7 per cent calculated on the original weight of rope.

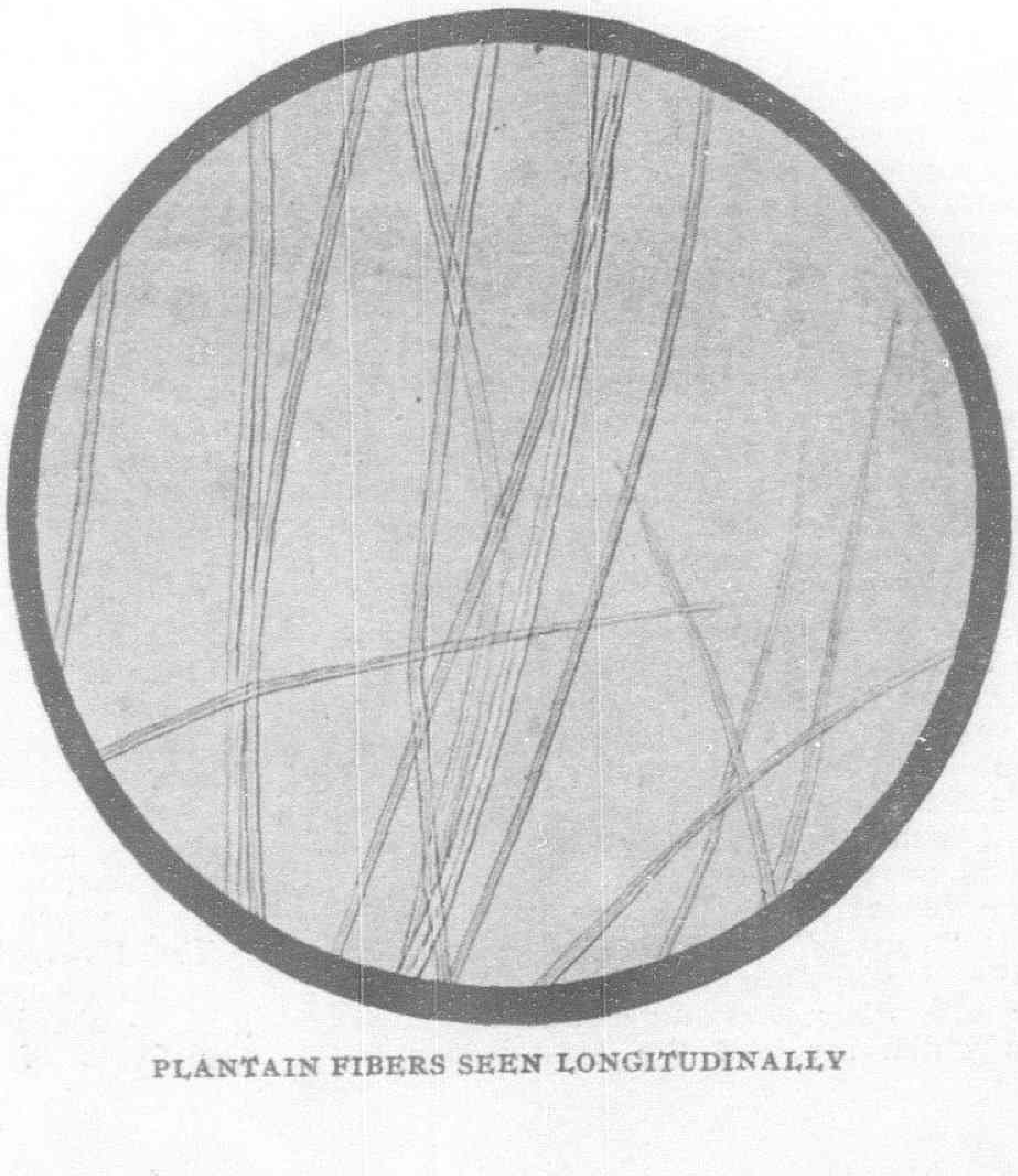
Specimen No. 2—A very dirty one-half inch rope of native manufacture, containing some unstripped strands of abacá; lost 21.82 per cent in cleaning.

Experiment No. 2—All conditions of digestion same as above; yield, 43.89 per cent, equal to 34.31 per cent pulp, calculated on original weight of the rope.

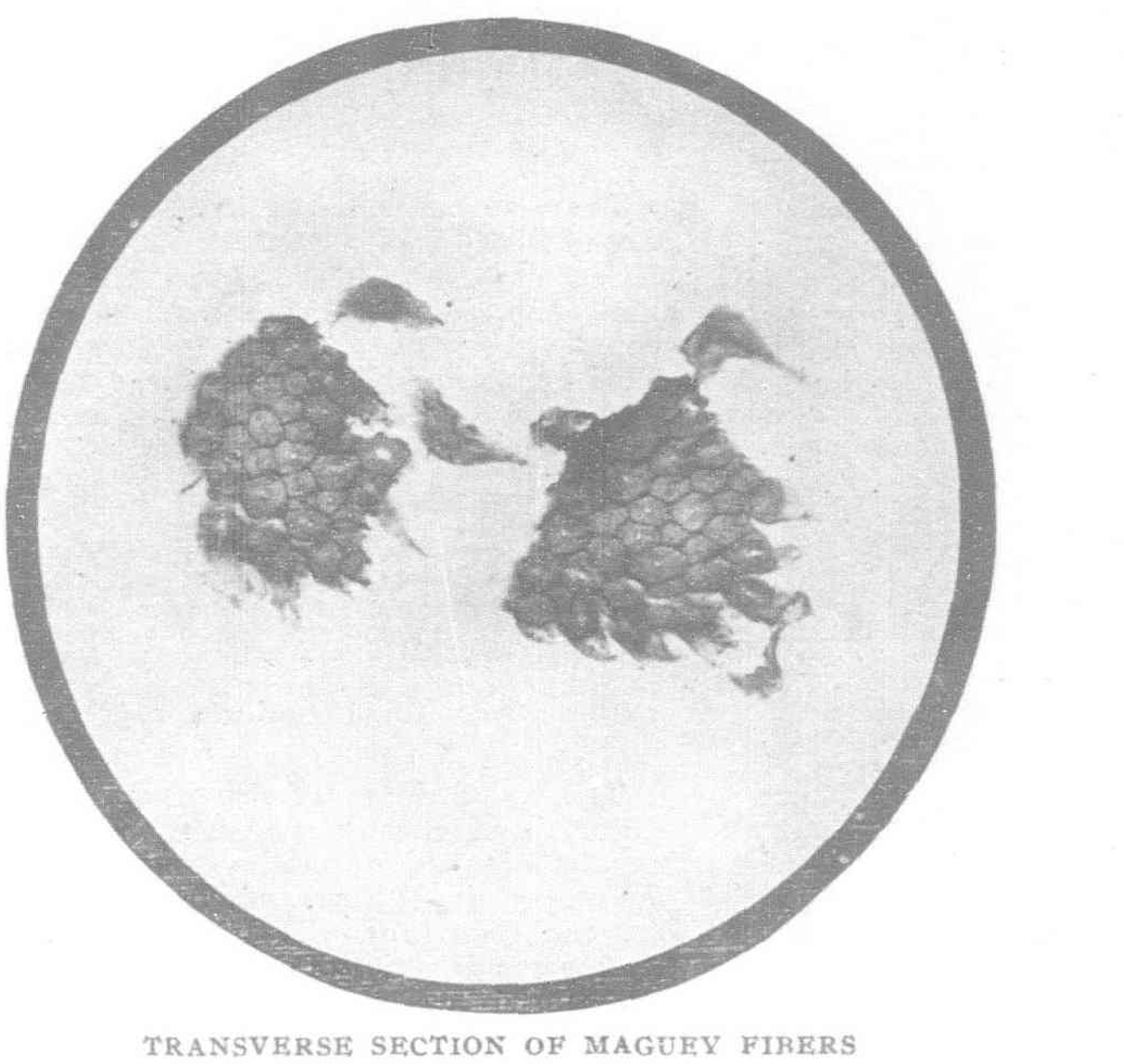
BLEACHING.—The operation of bleaching paper pulp as it is practiced under factory



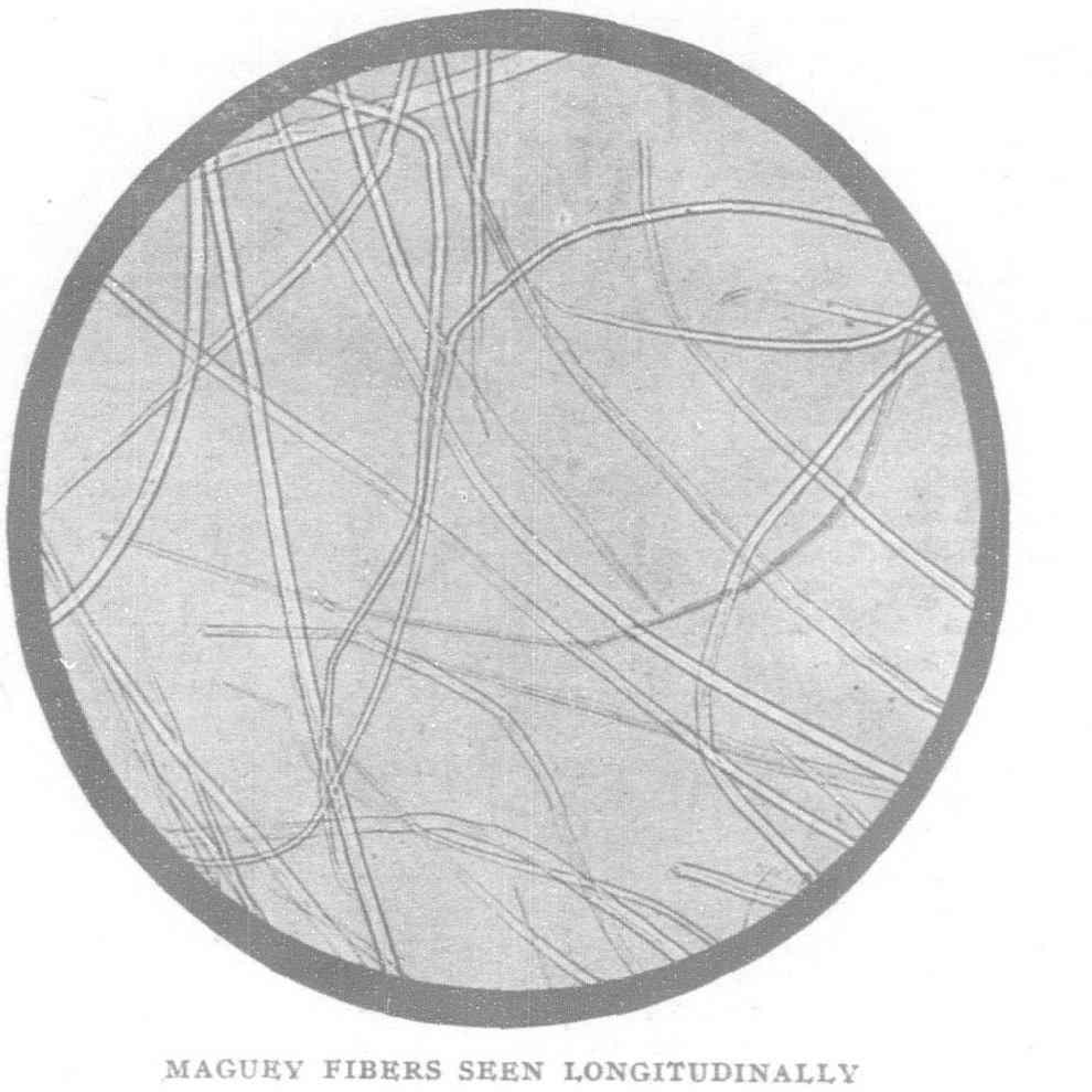
TRANSVERSE SECTION OF PLANTAIN FIBERS



PLANTAIN FIBERS SEEN LONGITUDINALLY



TRANSVERSE SECTION OF MAGUEY FIBERS



MAGUEY FIBERS SEEN LONGITUDINALLY

conditions, where time is the important factor, is difficult to approximate in the laboratory. However, quantitative bleaching experiments allow of considerable accuracy and should afford fairly reliable data for comparative purposes under practical conditions.

Bleaching powder (chloride of lime) is used almost to the exclusion of all other agents, so that it alone need be considered. This chemical is usually applied in the form of a clear solution of approximately 5° Bé. strength (specific gravity, 1.036), made by disintegrating the powder in water and clearing it by allowing it to settle or by filtering. The amount of bleaching powder necessary to produce the required shade depends on several factors, chief among which is the completeness of the previous treatment—that is, the removal of the noncellulose. The kind of fiber to be bleached also materially affects the amount of bleaching agent required. It is the practice to base all calculations as to quantity upon the amount of bleaching powder required to bleach 45.4 kilos of the original fiber. The quantities in general use for this weight of different fibers are stated as follows:—

	Kilos.
Rags (cotton and linen fiber)	0.907- 2 268
Straw	3 175- 4 53
Esparto	4 53 - 6.80
Wood	5.44 -11.34
Jute and Manila	4.53 - 9.07

The pulp is bleached either in the beating machine or in large chests termed "plotchers." The exact procedure varies in the different mills, but time-saving devices and schemes are quite generally employed—that is, acid is added to hasten the bleaching action and artificial heat is supplied for the same reason. The following details of procedure, adopted for quantitative bleach experiments on abacá, apply as well to all the other fibers studied. It will be noted that all digestion experiments were performed on 1-kilo lots of raw material. This furnished in most instances about 450 grams of pulp. The washed, dry residues were repulped by beating or shaking with a definite volume of water, and a clear solution of bleaching powder of known strength was added, slightly in excess of the amount required to produce a good white. In some instances the operation was performed in a model beating engine of the Hollander type of about one-half kilo capacity, but most of the bleaching was done in 3-gallon glass jars provided with mechanical agitators. The experiments were conducted at ordinary temperatures (about 30° C.), and no attempt was made at "souring" by means of acids or of otherwise accelerating the action. The endeavor was rather to obtain a slow, regulated process which involved the least injury to the cellulose and a maximum yield of bleached pulp. After a good, white appearance was obtained to the beaten pulp, the stuff was filtered and the residual available chlorine determined by titrating an aliquot portion of the filtrate with a standard solution of thiosulphate. The filtering and washing of the bleached cellulose was performed by means of suction, a large Buchner funnel with small perforations proving a very efficient mold in which to wash and press the pulp into discs for a final weighing.

BLEACHING ABACÁ PULP.—*Experiment No.* 1.—The dry residue from digestion No. 2, amounting to 328.4 grams, was placed in the engine and beaten to a homogeneous mass with 9 liters of water, then 2½ liters of clear bleaching powder solution, strength 2.35 per cent available chlorine (approximately 10° Bé.) were run in and the stirring continued until the pulp was of a light cream color. At this stage 100 cubic centimeters of the liquor required 31 cubic centimeters of N/10 thiosulphate, equivalent to 0.11 gram of chlorine, or to 12.1 grams of residual chlorine in the entire liquor. The amount of chlorine added (2½ liters of (2 35 per cent chlorine solution) was 58.75 grams. The difference between this quantity and the 12.1 grams remaining at the end of the bleach, amounting to 46.65 grams, represents the amount used in bleaching 324.8 grams of pulp or 1,000 grams of original waste. This is 14.2 per cent of chlorine, calculated on the weight of pulp, or 4.66 per cent calculated on the weight of the raw material originally taken. Using bleaching powder of 35 per cent available chlorine as a basis for calculating into terms of general usage, the above results are equivalent to 14.2 per cent of powder. The dry, bleached residue weighed 304.4 grams, so that there was a loss of 7.3 per cent in the bleaching operation.

Experiment No 2.—The residue from digestion No. 3, page, 445 weighing 317 grams was employed. A bleach liquor of much less strength (1.65 per cent available chlorine, approximately 3½° Bé.) was used, otherwise the conditions were the same as in the preceding experiment. The amount of bleaching powder required was 12.22 per cent of the raw material. The dry bleached residue weighed 297 grams, so that there was a loss of 6.4 per cent in bleaching.

DIRT AND FOREIGN MATTER IN ABACA WASTE.—The cleanness of the raw material is an important consideration with paper makers. Foreign substances, such as sand, do not disappear in the pulping process and appear to be multiplied in the bleached and beaten half stuff.

In this respect abacá waste as it is ordinarily collected becomes very much contaminated. The greater part of this accumulation of foreign matter can be avoided if extra care is taken in the stripping of the fibers, but even then the waste would need to be thoroughly dusted at the factory and either picked over by hand or cleaned by machinery, according to the methods used for the preparation of dirty rags and rope.

The Philippine Islands are the home of real Manila paper stock. The qualities which give to abacá its prominent position among the fibers of the world—*i. e.*, its strength and durability—make it a source of paper stock par excellence. The same conditions which confront paper manufacturers in other parts of the world are to be met here. The material must be collected from widely scattered localities, but with improved means of transportation it seems possible that this waste from abacá could be baled and shipped to market along with the cordage fiber. This will soon be the case when it becomes generally known that a product which has hitherto been a total loss will command from 1 to 2 cents a pound and the result will be to augment the revenues of the Manila hemp industry by millions of dollars annually.

PLANTAINS AND BANANAS.—Two other species of the family of plants to which abacá belongs, namely, the banana *(Musa sapientum)* and plantain *(Musa paradisiaca)*, are worth considering in regard to their availability for paper stock. The Philippines and the Indian Archipelago are regarded as the regions richest in bananas.

This highly important fruit grows in every province and inhabited island of the Philippines, both in the wild and cultivated state, and numbers over fifty species. The statistics regarding its production and area are interesting only as indicating the extent to which the natural, spontaneous growth has been supplemented and added to by such industry as the natives have exerted in setting out plants in the vicinity of their houses, which after planting receive very little, if any, attention in the way of real cultivation.

MAGUEY *(Agave cantula)*.—After abacá, maguey or sisal hemp may well be ranked as the second most important fiber-producing plant of the Philippine Islands. The maguey plant is widely distributed throughout the Archipelago and has long been used for local purposes.

The structural fiber of this and other species of *Agave* is used for cordage and like abacá, it finds its way to the paper mills in the form of old rope, binder twine, etc.

MAGUEY WASTE.—The waste fiber employed for the following digestion experiments was taken during some machine-stripping tests which were made on maguey leaves from Vigan, Ilocos Sur, by the Bureau of Agriculture of the Philippine Islands. The possibility of materially reducing the weight and bulk of this waste material by boiling it with lime in the localities where it is produced suggested itself, and experiments to decide this question were first undertaken.

Experiment No. 1.—One kilo of partially cleaned, dry waste was boiled in an open kettle for twelve hours with 20 per cent of quicklime calculated on the weight of the material. The washed, dry residue weighed 685 grams, or 68.5 per cent. The residue was unpulped, of a dark-brown color, and very coarse. Digested for five hours longer, under 6-7 atmospheres pressure with 10 per cent caustic soda calculated on the original weight taken. The yield was 31.5 per cent of a light-gray, well digested pulp.

Experiment No. 2.—Uncleaned waste; 20 per cent quicklime; time of digestion, five hours; pressure, 6-7 atmospheres; yield, 55 per cent of a coarse, brown residue only suitable for cheap wrapping paper.

Experiment No. 3.—Time of digestion, twelve hours; all other conditions as in experiment 2; yield, 38 per cent. The residue appeared to be well pulped, but not entirely free from cellular matter.

Experiment No 4.—Twenty-five per cent caustic soda, calculated on the weight of material digested; time, five hours; pressure, 7 atmospheres; yield, 35 per cent; residue, light-gray, and it appeared to be very well boiled.

Experiment No. 5.—Twenty per cent caustic soda;, time, five hours; pressure, 7 atmospheres; yield-41.5 per cent; residue, dark-gray; digestion, in complete.

Experiment No. 6.—Twenty per cent caustic soda; boiled twenty-four hours at ordinary pressure with reflux; yield, 50 per cent; residue similar to that from experiment 2.

Conclusions.—For the preparation of half stuff for brown wrapping paper the waste may be lime boiled under pressure with good results both in respect to yield and to economy; however, an open cook with lime gave negative results. The weight of the waste may be reduced by about 30 per cent by this latter procedure, but the resulting product is not in any sense a paper pulp. Caustic soda (25 per cent calculated on the gross weight of the material) effects a complete re-solution of the incrusting material.

BOWSTRING HEMP.—*Sanseveria zeylanica* is found quite widely distributed throughout the Islands and is cultivated in some localities for cordage and textile purposes. It is mentioned in this place because of the similarity which its structural fiber has to that of maguey and because of the possibility of its becoming a plant of considerable commercial importance. Like maguey, it readily lends itself to machine stripping and in the event of a more extensive cultivation the waste fiber may be worth considering.

PHILIPPINE GRASSES.—The following statistics which refer to the paper industry of India are specially significant in their bearing on the possibilities of paper production in the Philippines, as the raw materials in general use in the mills of India are very similar to those which we are about to discuss:—

There are eight paper mills in operation, two of which are private concerns. The capital invested so far as information is obtainable is rupees 7,320,000 (approximately $2,500,000 gold). Most of the white and blue foolscap and much of the blotting paper, note paper, and envelopes used in the Government offices are now made in the Indian mills.

The total quantity of paper made in 1902 was 47,000,000 lbs., valued at $2,092,000 gold, approximately.

The capital has trebled in twenty years since 1863 and the production and number of persons employed has increased sixfold during the same period.

Cogon.—Two grasses, cogon and taláhib, are found in the Philippine Islands growing wild and apparently in sufficient quantities to warrant some inquiry as to their economic use. In the Philippines many coarse grasses are termed cogon, but, properly speaking, cogon (*Imperata exaltata* Brong.) is the broad-leaved, gregarious variety, 2 to 4′ in height, which grows in even stands on open lands, foothills, and mountains. Where nipa is not to be obtained the true cogon is highly prized for thatching purposes. Conditions of drought do not appear to affect its growth, as it seems to thrive on a soil containing but little moisture; indeed, even in the driest season it will spring up in a green and thrifty manner after being burned over, while, on the other hand, it is not found along river bottoms or on lands subjected to overflow during the rainy season. The study of cogon grass was conducted in conjunction with that of esparto in this laboratory because the use to which it is proposed to put the former is identical with that established for the latter. A direct comparison is therefore important and necessary, We are furnished with the Spanish variety of esparto from Barcelona through the kindness of Don Enrique Zobel, of Manila, and of the Compañía General de Tabacos de Filipinas.

Ash, alkaline hydrolysis, and cellulose calculated on dry material.

	COGON GRASS.	ESPARTO GRASS (SPANISH).
	Per cent.	Per cent.
Moisture	9.82	8.68
Ash	4.53	3.71
Hydrolysis (*a*)	25.77	19.75
Hydrolysis (*b*)	40.00	37.16
Cellulose	50.11	55.16

Chemical composition of cogon and esparto grass.

	COGON.	ESPARTO.
	Per cent.	Per cent.
Cellulose	46.68	48.25
Fat and wax	1.16	2.07
Aqueous extract	10.80	10.19
Pectous substances	26	26.39
Water	11.33	9.38
Ash	4.03	3.72

Experimental work with mature cogon grass, the results of which are given below, indicates, first, the yield of paper cellulose to be expected under factory conditions of treatment; second, the approximate amount of caustic soda necessary to produce a well-boiled pulp; third, the comparative, resistant nature of the cellulose to further hydrolysis.

Percentage of—	Experiment 1.	Experiment 2.	Experiment 3.	Experiment 4.
Soda liquor.......	2	2.4	2.5	3
Caustic calculated on weight of material............	10	12	12.5	15
Yield of pulp......	47.34	45.5	45.42	44.25

All four of the pulps were light-gray in color and they appeared to be well reduced. The digestions were carried out in an autoclave built of bronze and the heating was done with direct fire. By the use of patent boilers of the vomiting type and by heating with direct steam (improvements which are in general use with esparto grass) results equal to those given above could no doubt be brought about in a much shorter time. The pulp has a great tendency to form little balls which are very similar to those encountered with esparto and straw, hence rotary boilers would not be suitable. The modern tendency is either to increase the pressure or the amount of caustic soda used, thus diminishing the duration of the digestion.

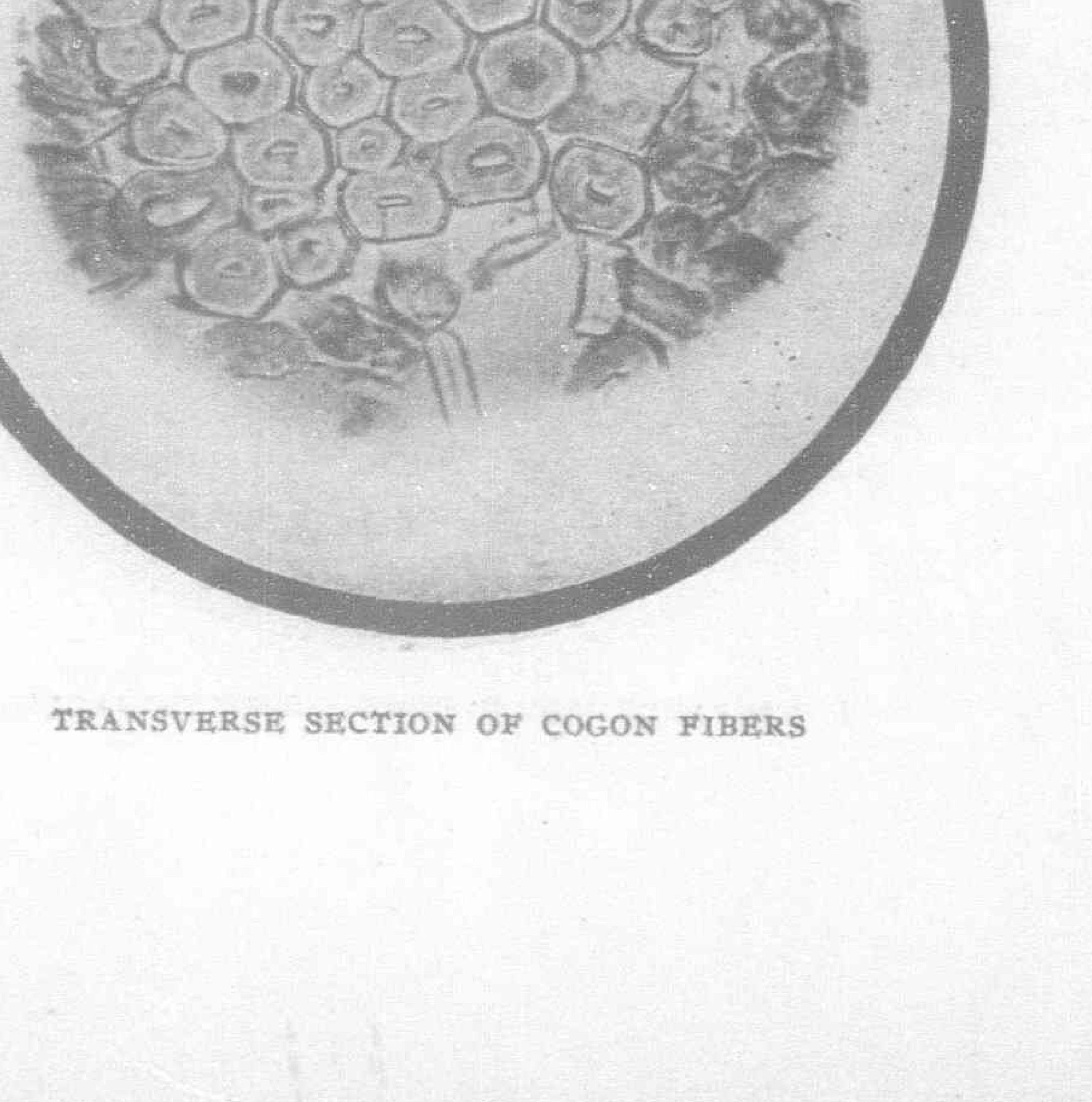
Two digestions with 2 per cent liquor, but with 20 per cent caustic soda, calculated on the weight of the material, were carried out at 4 to 5 atmospheres pressure for three hours. The yields of pulp were 44 and 45 per cent, respectively.

In some cases, esparto and straw are boiled in open kettles, but if this is done, a much longer time is required to accomplish the same result. The following table gives the results of two such experiments:

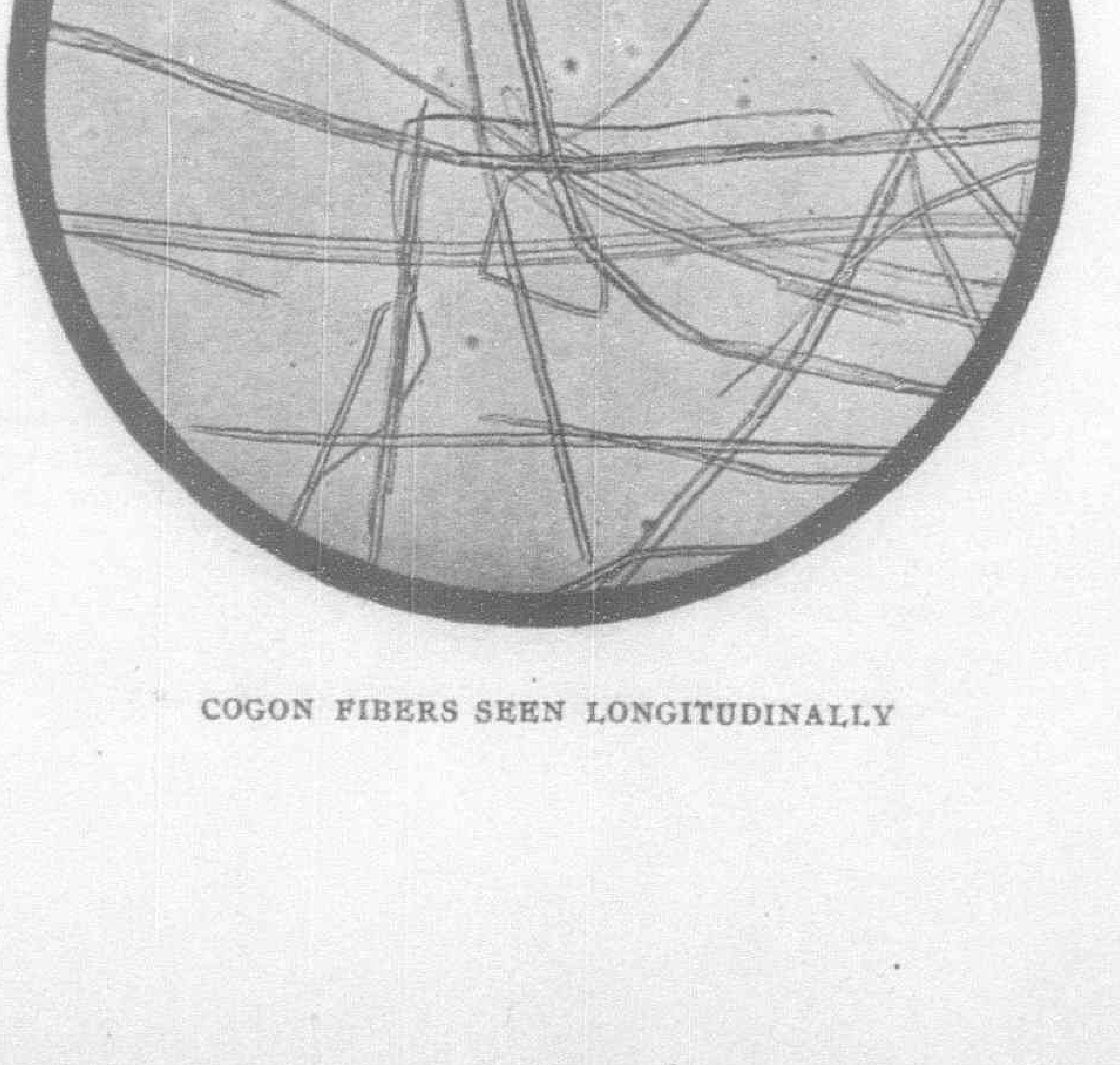
Digestion of cogon at ordinary pressures.

	I.	II.
Strength of liquor (per cent)	2.6	3
Caustic soda (per cent)	13	15
Time of boiling (hours)	12	12
Yield of pulp (per cent)	51.25	48.81

These results show that cogon could be boiled in open digesters with good results, to make the cheaper grades of printing paper, where time is not as important a factor as the cost of the process. The use of quicklime, the chemical so commonly employed in the manufacture of strawboard, did not give satisfactory results with cogon grass because the lime seems to combine with the soluble constituents from the grass and it then becomes extremely difficult to wash out. The pulps produced in this manner in the laboratory were coarse and brown. However, for the cheapest printing paper and for boards, a lime boiling in an open cook, or perhaps under 1 to 3 atmospheres pressure, would effect great saving in the cost of the chemicals to be used.

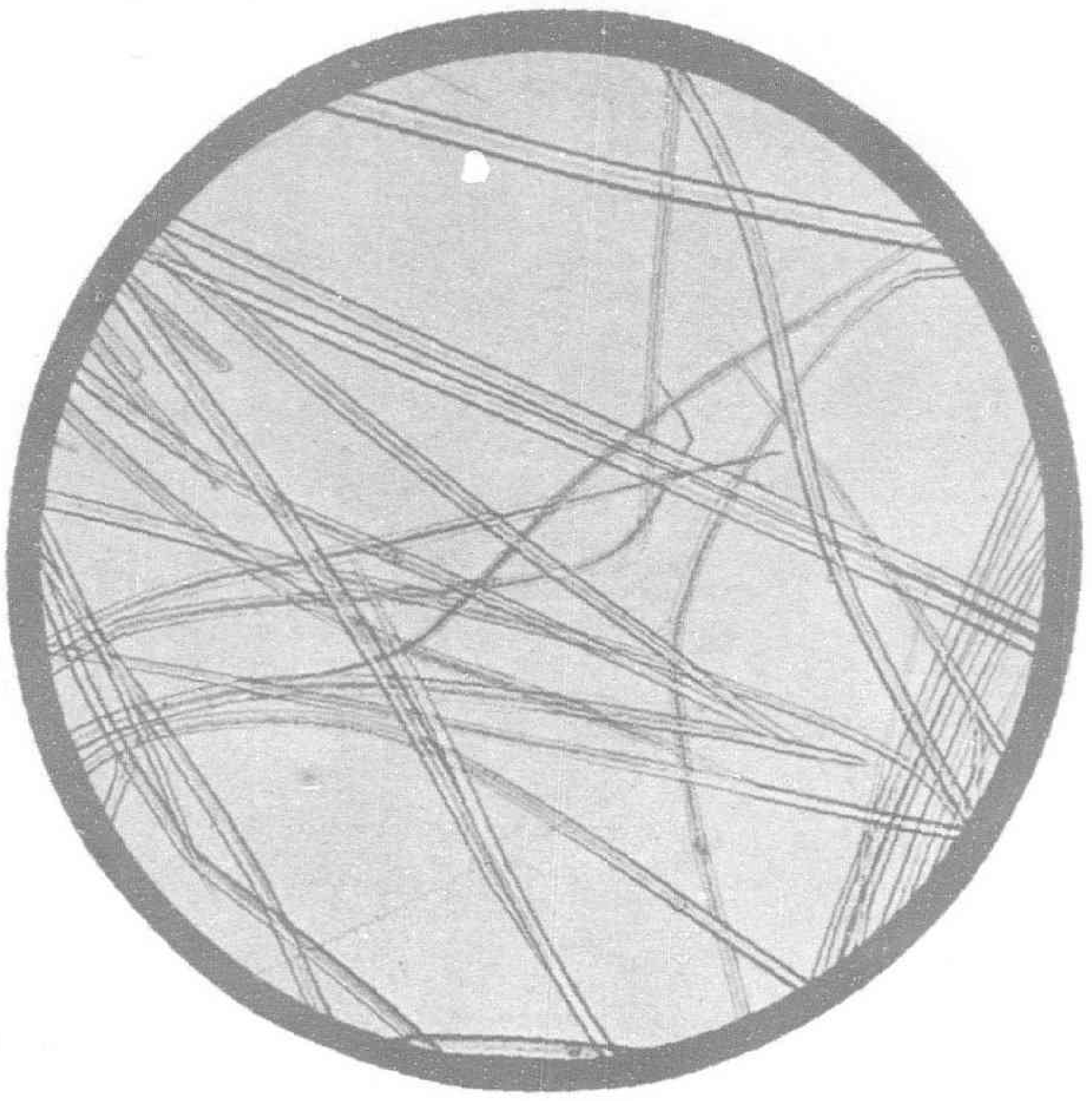


TRANSVERSE SECTION OF COGON FIBERS



COGON FIBERS SEEN LONGITUDINALLY

TRANSVERSE SECTION OF TALÁHIB FIBERS


TALÁHIB FIBERS SEEN LONGITUDINALLY

The investigation of cogon also proved that no preliminary cutting down of the grass is necessary; after being dried and hand picked or machine cleaned it is fit for immediate digestion.

Bleaching of Cogon Grass Pulp.—*Experiment No 1.* —The residue from digestion No. 3, page 458, amounting to 454.2 grams, was repulped in 10 liters of water; 1 liter of a bleaching solution of 2.35 per cent available chlorine (approximately 10° Bé.) was added and the whole allowed to bleach over night. No residual chlorine remained, but the pulp was of a clear, white color. The amount of chlorine consumed was 23.5 grams (1,000 cubic centimeters of 23.5 per cent solution). This represents 67.1 grams of powder, equivalent to 67.1 per cent. The bleached pulp weighed 428.7 grams, which gave a loss of 5.62 per cent bleaching.

Experiment No. 2.—A residue from digestion with 20 per cent caustic soda, page 4.9, amounting to 440 grams, was submitted to exactly the same conditions as those given above. The residual chlorine amounted to 0.78 gram, which leaves 22.72 grams as the amount consumed. This represents 64.9 grams of powder. The bleached pulp weighed 418 grams which represents a loss of 5 per cent in bleaching.

This is a coarse-jointed grass, 6 to 10′ in height, gregarious, growing in tufts from stout underground rootstalks. It is found to be distributed from British India to southern China, Malasia, New Guinea, the Philippine and Caroline Islands. It is very common throughout the Archipelago and is frequently confounded with cogon grass, but it is very distinct from the latter in appearance and in its habit of growth. It thrives best in valleys and in low, moist places, especially in areas which are flooded during the rainy season. It is very persistent and difficult to eradicate; simple cutting or burning does not appear to decrease its growth but rather to improve its yield and quality. Other related species are *Saccharum sara* (the Munj grass of India) and *Saccharum officinarum* (the well-known sugar cane of all tropical countries). A sample of mature grass consisting of entire stems and leaves gave the following figures:—

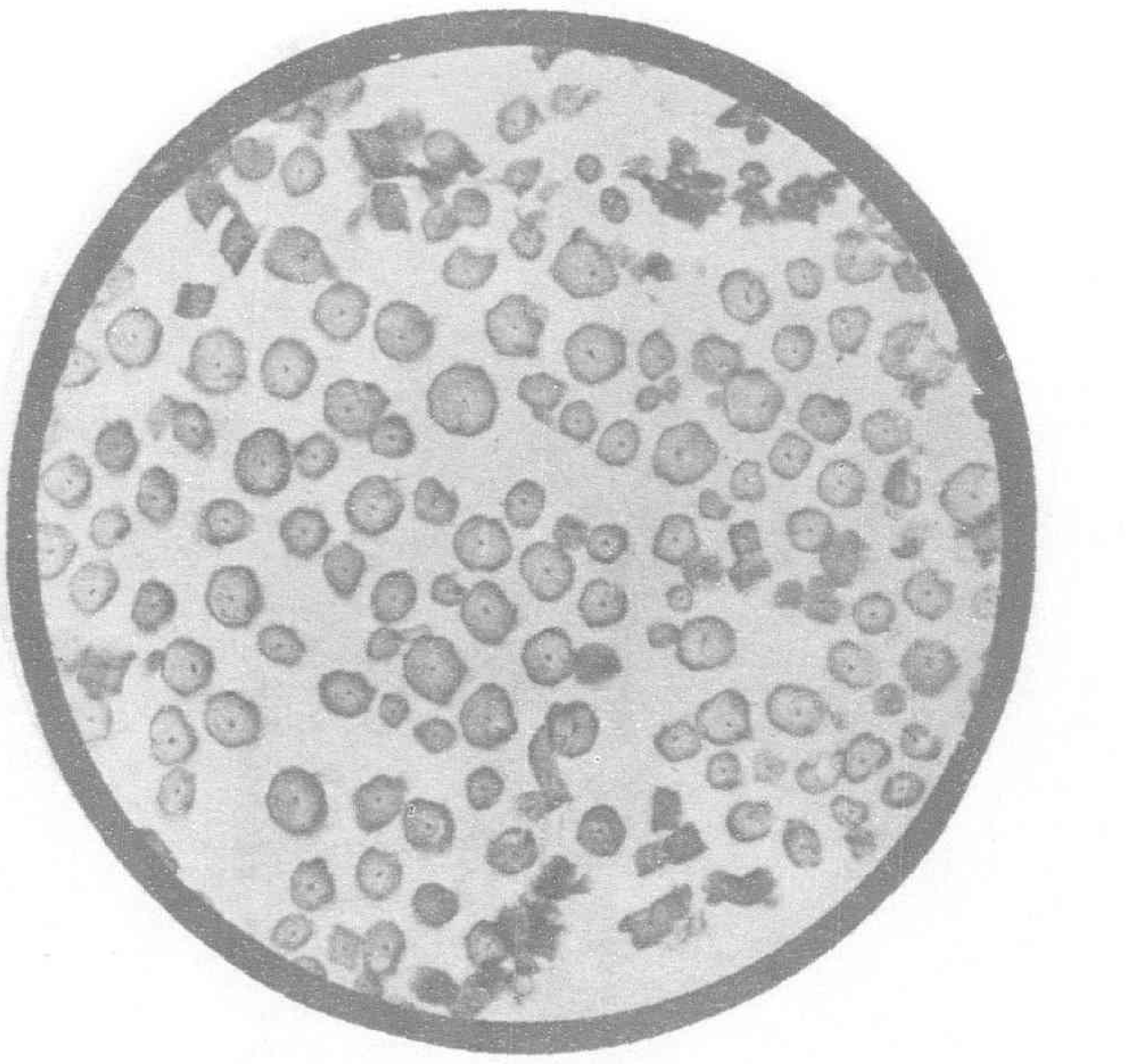
	Per cent.
Moisture	10.23
Ash	5.46
Hydrolysis *(a)*	27.44
Hydrolysis *(b)*	40.53
Cellulose	53.90

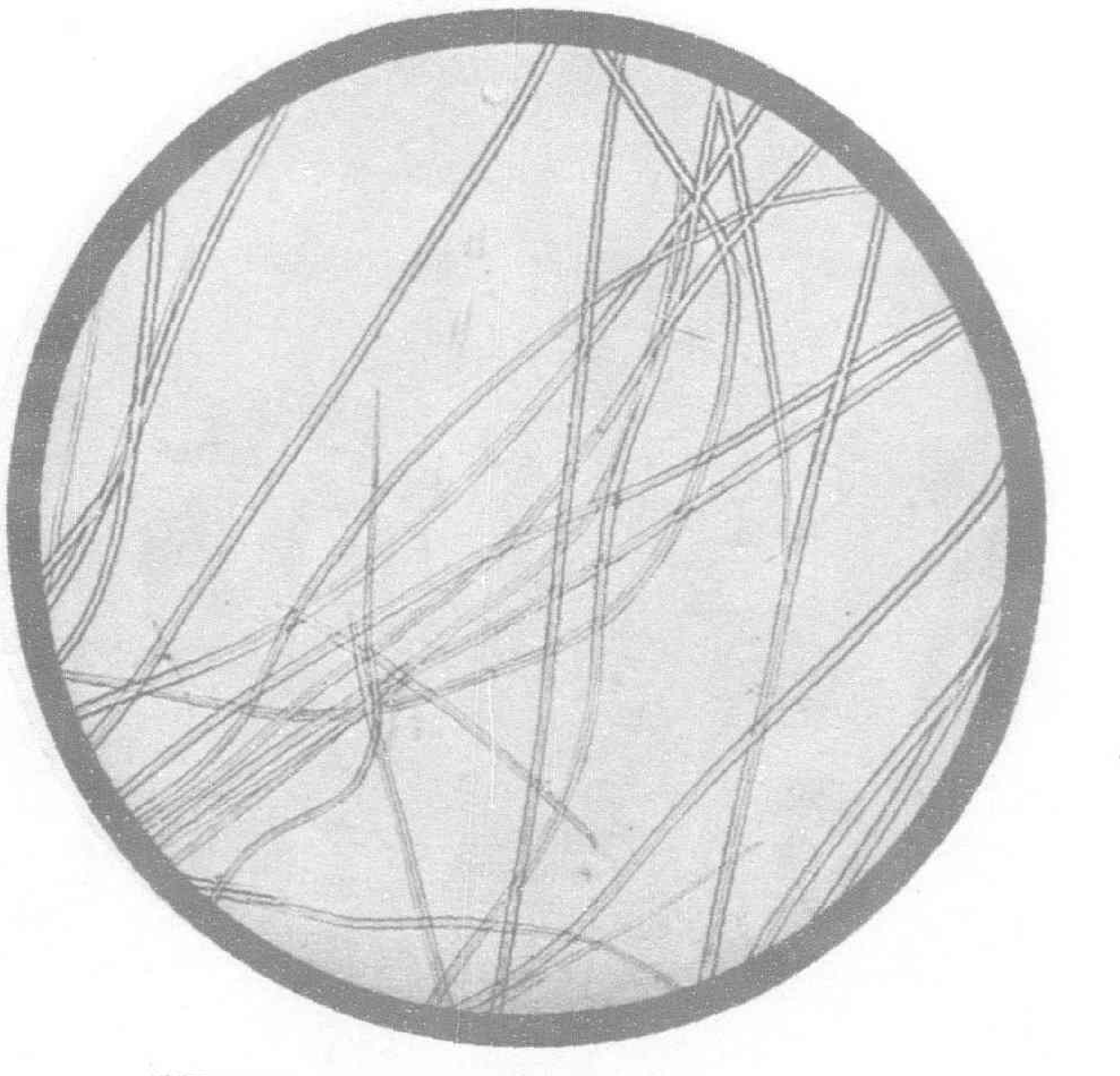
If this grass is allowed to become too dry before cutting, the nodes harden and prove difficult to pulp, and a considerable quantity of shive is the result, so that some mechanical crushing or breaking of the stems is necessary. Only one digestion experiment was made. The grass was cut into short pieces and boiled in water for three hours to soften the nodes, then digested during six hours with 12½ per cent of caustic soda, calculated on the weight of the grass. Pressure, 4 to 5 atmospheres. Yield of pulp was 45.57 per cent. The residue bleached to a good white with only 3.2 per cent loss in weight by the use of 5.7 per cent of bleaching powder, calculated on the original weight of the material digested.

Dimensions of the Ultimate Fibers of Some Philippine Fiber Plants.

[Table by Dr. E. B. Copeland. All measurements are in millimeters.]

Name.	Length.			Diameter. Total.			Lumen.		
	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum
Abacá (*Musa textilis*)	6.00	3.98	2.45	.021	.017	....	.009	.0066	....


TRANSVERSE SECTION OF ESPARTO FIBERS


ESPARTO FIBERS SEEN LONGITUDINALLY

Plantain (*Musa sapientum* var. *paradisiaca*)	7.30	5.49	4.15	.026	.020	.018	.016	.0106	.007
Maguey (*Agave cantula*)	4.93	2.38	1.00	.026	.018	.015	.013	.007	.004
Cogon grass (*Imperata exaltata*)	1.82	0.99	0.46	.021	.011	.005	.013	.0014	.001
Tálahibgrass (*Saccharum spontaneum*)	2.82	1.59	0.80	.020	.015	.012	.010	.0013	.1115
Bamboo (*Bambusa blumeana*)	1.81				.0075				
Dwarf bamboo (*Bambusa lumanpao*)	4.10	2.57	1.20	.028	.0156	.005	.025	.018	.001
Rice straw (*Oryza sativa*)	0.88				.0025				
Buri palm (*Corypha umbraculifera*)	2.80	2.11	1.10	.015	.013	.010	.007	.0034	.002

Table of dimensions of some of the more important fibers used in the manufacture of textiles and paper.

[Taken from M. Vetillart.]

Name.	Length of fiber cell.			Diameter of fiber cell.		
	Maximum	Mean	Minimum	Maximum	Mean	Minimum
Flax (*Linum usitatissimum*)	66.0	25-30.0	4.0	0.037	0.022	0.015
Hemp (*Cannabis sativa*)	55.0	22.0	5.0	.050	.022	.016
Jute (*Corchorus olitorius*)	5.0	2.0	1.3	.025	.020	.020
Esparto grass (*Stipa tenacissima*)	3.5	0.5	1.3	.018	.0125	.007
Spanish grass (*Lygeum spartum*)	4.5	2.5	1.3	.020	.016	.012
Bowstring hemp (*Sanseveria sp*)	6.0	3.0	1.5	.026	.020	.015
Paper mulberry (*Broussonetia papyrifera*)	25.0	15.0	6.0	.035	.030	.025
Talipot palm (*Corypha umbraculifera*)	5.0	3.0	1.5	.028	.024	.016
Coconut palm (*Cocos nucifera*)	1.0	7.0	0.4	.024	.020	.01

REMARKABLE STEAMSHIP RECORD

The White Star flag, which floated at the masthead of the steamers *Doric* and *Coptic* for many years, has abandoned the Pacific Ocean. Until recently these ships were owned by the White Star people, although they were operated, under charter, by the Occidental and Oriental Steamship Company of San Francisco. Both ships are now owned by Americans, presumably, they having recently passed over to the ostensible proprietorship of the Pacific Mail.

In this connection some facts about the remarkable career of the *Doric* since she sailed from Liverpool, January 16th, 1896, for the Pacific trade, may prove interesting to mariners. She arrived at San Francisco on her maiden voyage from England, February 26th, 1896, and docked in berth the following day. Her steaming time from port to port was 41¼ days. The distance run was 13,600 knots (about 330 knots per day), and during the whole voyage she made but one stop of 50 mins. for the repacking of a high-pressure gland, and was delayed about 6 hrs. awaiting daylight at Sandy Point, Straits of Magellan. It will be difficult to find a record to equal the one made by the *Doric* on this maiden trip in view of the fact that her engines and boilers were new, having had a trial trip of only 4 hrs. previous to her sailing from Liverpool.

After laying at San Francisco about a week the *Doric* began her career in the Occidental and Oriental service, sailing from the Pacific Coast port for Oriental harbors March 5th, 1896, and during her service under the White Star flag she faithfully did her work. The following *résumé* of work done by her engines should interest the marine engineers. In 10 yrs. and 4 mos.—or better still, in 50 round voyages to the Orient,—divided into five periods of 10 voyages each, the results are as follows:—

1st period	= 10,050 hrs.	= under weight;	142,509 knots,	14.18 knots per hr.;	5½ per cent slip;	72 tons per day
2d "	= 10,541 "	= " "	150,046 "	14.23 " " "	5⅓ " " "	73⅓ " " "
3d "	= 10,752 "	= " "	151,208 "	14 " " "	4¾ " " "	72¾ " " "
4th "	= 10,891 "	= " "	152,325 "	14 " " "	6 " " "	72 " " "
5th "	= 10,941 "	= " "	153,052 "	14 " " "	5⅔ " " "	77 " " "
50 voyages	= 53,175 "	= " "	149,140 "	14 " " "	5½ " " "	73½ " " "

Coals were of very inferior quality during the 5th period, and the ship's average speed includes all slows in fogs and all stoppages. For a 14-knot steamer, therefore, the record is most excellent.

IMPORTANT SHIPBUILDING CONTRACTS

On September 27th, proposals for constructing four vessels for the Quartermaster's Department of the U. S. Army, in the Philippine Islands, were opened in Manila by Captain W. S. Scott, Quartermaster, in charge of water transportation. The Hongkong and Whampoa Dock Company, Ltd., of Hongkong, and the Shanghai Dock and Engineering Company, Ltd., of Shanghai, submitted the only tenders covering all the work, although there were four other bids on part of the contracts. The Hongkong concern secured three of the four jobs. The bids were as follows:—

Sea-going tug.—Hongkong and Whampoa Dock Company, $86,280, to be completed in 9½ mos.; Shanghai Dock and Engineering Company $105,376, to be completed in 10 mos.; Findlay & Co., Manila, $106,885, to be completed in 10 mos.; Uraga (Japan) Dock Company. $109,500, to be completed in 380 days.

Steel launch.—Hongkong and Whampoa Dock Company, $17,540, to be completed in 7½ mos.; Shanghai Dock and Engineering Company, $19,980, to be completed in 8 mos. (Charles S. Robinson, Manila, proposed to sell a launch for $5,500, which was rejected.)

Stern-wheel steamer.—Hongkong and Whampoa Dock Company, $12,146, to be completed in 7½ mos.; Shanghai Dock and Engineering Company, $39,220, to be completed in 8 mos.

Hull for steam launch.—Hongkong and Whampoa Dock Company, $25,440, to be completed in 8½ mos.; Shanghai Dock and Engineering Company, $15,540, to be completed in 8 mos.; El Varadero, Manila, $8,600, to be completed in 5 mos. This contract was secured by the Manila concern.

JAVANESE FOR INDO-CHINA

M. Hardouin, French Consul, was recently sent to Java by M. Beau to study the question of whether Javanese labor, used so successfully in New Caledonia, could be introduced into Indo-China. Since his return he has communicated his conclusions to the Chamber of Agriculture of Cochin China. They are very favorable, and the planters of Cochin China appear disposed to make the experiment. At the same time, although a large tract of territory still remains uncultivated in that country, the Annamite population is developing with a sufficient rapidity, so that it may perhaps be wise to leave this reserve to them. It would be a different thing in Cambodia, where the population is extremely scattered.—*The London and China Express.*

PHILIPPINE MINERS ORGANIZE

The Philippine Miners' Promotion Association has been organized in Manila for the purpose of disseminating literature throughout the Islands and in the United States setting forth the general mineral resources of the archipelago. The officers are as follows:—Governor-General James F. Smith, honorary president; George Landers, president; M. A. Clarke, vice-president; H. B. McCoy, 2d vice-president; C. E. Hamilton, 3d vice-president; Captain Collette, 4th vice-president; George Morgan, treasurer; Chauncey McGovern secretary.

"THE COMMERCIAL ORIENT IN 1905"

(By *Walter J. Ballard*, Los Angeles, Cal., U. S. A.)

The Commercial Orient in 1905 is the title of a monograph just issued by the Bureau of Statistics of the Department of Commerce and Labor, at Washington.

From it we learn that the population of the Orient is 911,200,000; that the total imports amount each year to $1,707,000,000; that American goods form $128,100,000 of those imports, or only 7.5 per cent.; that the same countries have yearly exports of $1,616,700,000, of which the United States takes a total of $155,800,000, or 9.6 per cent.

Here are the countries and the figures for 1905 in the order of imports:—

	Population	Imports	American sales.
China	426,300,000	$ 326,400,000	$56,100,000
British India	294,400,000	300,200,000	4,100,000
Japan	46,700,000	243,300,000	51,900,000
Straits Settlements	600,000	168,300,000	1,100,000
Egypt	9,700,000	106,600,000	2,400,000
Turkey	24,000,000	101,200,000	1,100,000
Algiers	4,700,000	70,900,000	600,000
Dutch East Indies	35,700,000	70,200,000	900,000
British East Indies	700,000	41,900,000	200,000
Ceylon	3,700,000	37,800,000	200,000
French Indo-China	18,000,000	35,700,000	
Malta	200,000	3,480,000	
Philippine Islands	8,000,000	30,900,000	5,800,000
Persia	9,500,000	27,700,000	500,000
Malay States	800,000	21,400,000	
Siam	6,000,000	21,300,000	
Tunis	1,900,000	16,100,000	200,000
Aden	....	13,600,000	1,400,000
Korea	12,000,000	13,200,000	900,000
Formosa	2,800,000	11,500,000	700,000
Morocco	5,000,000	10,500,000	
Cyprus	200,000	2,300,000	
French East Indies	300,000	1,100,000	
Totals	911,200,000	$1,707,000,000	$128,100,000

	Exports in 1905.	American purchases.
British India	$496,300,000	$29,400,000
China	166,400,000	19,700,00
Japan	160,100,000	46,800,00
Straits Settlements	142,600,000	16,000,000
Dutch East Indies	109,700,000	7,600,000
Egypt	100,000,000	6,200,000
Turkey	63,300,000	7,900,000
British East Indies	58,500,000	
Algiers	52,500,000	200,000
Malay States	35,400,000	
Ceylon	33,800,000	2,700,000
Philippine Islands	32,400,000	15,700,000
French Indo-China	30,200,000	
Malta	29,900,000	
Siam	27,500,000	
Persia	18,300,000	
Tunis	13,800,000	
Aden	11800,000	1,900,000
Formosa	11,400,000	1,400,000
Morocco	7,000,000	300,000
Korea	5,900,000	
French Indies	5,900,000	
Cyprus	2,400,000	
Totals	$1,615,700,000	$155,800,000

From our standpoint the anomalies are—

	We buy.	We sell only.
Ceylon	$2,700,000	$200,000
Formosa	1,400,000	700,000
Dutch East Indies	7,600,000	900,000
Egypt	6,200,000	2,400,000
Turkey	7,900,000	1,100,000
British India	29,400,000	4,100,000
Straits Settlements	16,000,000	1,100,000
Philippine Islands	15,700,000	5,800,000
Morocco	300,000	
Totals	$87,200,000	$16,300,000

Thus we buy five and one-half times as much as we sell in our trade with the nine Oriental countries. That is not by any means a profitable American proposition.

Then again, we do not sell a dollar's worth to eight of the entire list of Oriental countries named.

The section of the world occupied by people of Oriental habits includes all of Northern Africa, Turkey in Europe as well as Asia, all of Southern and Eastern Asia and the East Indian Islands. This territory, stretching from North Africa to the East Indies and occupied by Oriental people, is about one-fifth of the land surface of the globe, but its population is more than half the people of the entire world.

Yet to this vast aggregation of people—911,200,000—we are selling only $128,100,000 worth of goods yearly—about fourteen cents per capita—while we buy $155,800,000 worth—or about seventeen cents per capita.

Evidently American exporters have hardly yet touched the fringe of the Orient's import garment.

It must be borne in mind by American manufacturers that in order to do the business of the Orient goods must be made in a manner and style which conform to the habits of life in a tropical climate, and no reliance must be placed on their using the manufactures which we usually make, mostly suited, as they are, to dwellers in the temperate zones. We must study the wants of an Oriental tropical zone people to sell them goods in any great quantity.

In a few articles absolutely necessary, such as mineral oils for lighting, the Oriental has adapted himself, says the Bureau of Statistics, to the ways of the Occident, but the very large proportion of articles offered he declines unless they are so prepared as to meet the habits of life to which he and his fathers before him have been accustomed. Experienced European manufacturers and exporters understand this. That is why they are able to sell sixty-six per cent of the $1,000,000,000 worth of goods which the Orient imports from the Occident yearly, and are steadily increasing their sales, while the United States sells only one per cent and practically makes no increase in its total. Yet a large part of the $650,000,000 worth of goods which Europe sells annually to the Orient consists of goods of a character which the United States can readilly produce. Why we are not producing them is the problem for American manufacturers and exporters to solve, and act accordingly.

In that part of the Orient lying in the temperate zone American exports are progressing along certain limited lines. In cotton goods, mineral oils and copper for China, says the monograph, and machinery, railway supplies, manufactures of iron and steel, and flour for Japan and Korea, the United States is rapidly developing its sales. North China can wear the heavy cottons we generally make. South China, however, relies upon Europe for the light cottons it needs in its subtropical climate. In mineral oils, needed everywhere, our sales are fairly uniform all over the Orient, except where the oils of Russia and Sumatra are produced in too close proximity for American oil competition. China's new copper coinage calls for our copper as the most suitable. Japan's railroad and factory building benefits us chiefly by reason of our market being nearer to her than that of Europe. A growing taste in Japan for flour, coupled with her rice shortage of recent years, brings the demand now upon our Pacific coast ports for that commodity.

The $1,000,000,000 market in the Orient for Occidental goods is practically made up of the following:—

Cotton goods	$250,000,000
Iron and steel	100,000,000
Provisions	40,000,000
Mineral oils	40,000,000
Medicines, drugs and dyes	25,000,000
Flour	20,000,000
Other manufactures	505,000,000
Coal	20,000,000

Again, Europe is able, through her banking institutions in the Orient, often to beat us by offering more liberal terms of credit. The banking use in the Orient of some of our many millions of idle dollars would materially pave the way for a large increase in our exports to the Orient, just as the German and British banks are doing for German and British exports, not only in the Orient but also in South and Central America. Exports are a science and should be studied as such, not merely as a haphazard means of dumping surplus stocks. The opportunity is ours for the grasping.

PHILIPPINE TIMBER INDUSTRY

Major George P. Ahern, U. S. Army, Director of Forestry for the Philippine Government, has forwarded the following recommendations to the Secretary of the Interior, which are self-explanatory:—

The *Forest Act* (*Sections* 11 *and* 12) provides for two scales of charges on timber taken from public lands. In provinces in Class A the charges are almost double those imposed in provinces in Class B. This difference in charge has been an incentive to timber licensees to confine their logging operations to provinces in Class B, where the stand of timber is large and where extensive logging operations can be carried on without detriment to the forest. Almost all of the larger operators are now located in Class B provinces. The operations in the other provinces are usually carried on to supply the local demand, with three exceptions, *viz:* The provinces of Bataan, Bulacan and Zambales. In these provinces timber is cut for the Manila market.

The forests in Class A provinces have been severely cut over in times past and need protection, which can now be provided without the aid of additional charges.

Although the present scale of Government charges on timber in Class A provinces is below similar scales of charges for woods of the same quality in India and Java, I believe that, in view of the poverty of the people, the difficulties of transportation and the need of timber for all classes of construction in these Islands, we can afford at this time to make the change. The following change is respectfully recommended:—

That *Sections* 11 and 12 *of the Forest Act* (No. 1148) be amended to eliminate the mention of classes of provinces, and that but one scale of charges on timber be imposed, and that the scale of charges imposed in Class B provinces be adopted for all provinces. If this recommendation be approved, *Sections* 11 and 12, as amended, will read as follows:—

Sec. 11. For the purposes of this Act the various native trees are divided into four groups:

The first group shall include acle, betis, baticulin, camagón, ebony, ipil, lanete, mancono, molave, narra, tindalo, and yacal.

The second group shall include alupag, aranga, banaba, bansalaguin, banuyo, batitinan, bolongeta, calamansanay, calantas, dungon, guijo, macaasin, malacadios, mangachapuy, palo Maria, supa, teak and tucancalao.

The third group shall include agoho, amuguis, anubing, apitong, batino, bitanhol, catmon, calumpit, cupang, dalinsi, dita, dungonlate, malacmalac, malapapaya, malasantol, mayapis, nato, palosapis, panao, sacat, santol, tamayuan, and tanguile.

The fourth group shall include anahao, anam, apuit, bacao, balacat, balinhasay, batete, bayoc, bonga, bulao, lauan, malaanonang, malabalac, malabonga, mangasinoro, manicnic, pagatpat, and pagsainguin.

Sec. 12. The metric system of weights and measures, as adopted by the *Revised Statutes of the United States*, shall be used.

On each cubic meter of timber which may be cut in any public forest or forest reserve in any of the provinces of the Philippine Islands for domestic sale or consumption, or for export, there shall be paid, within 30 days from date of the receipt by the owner or his agent of the order of payment of the Government charge on the same, into the insular treasury, as provided by existing law, the following sums:—

On all timber included in the first group ₱2.50.
On all timber included in the second group ₱1.50.
On all timber included in the third group ₱1.00.
On all timber included in the fourth group and on all non-enumerated timber ₱0.50:—

Provided, That the taxes imposed in this section on ebony and camagon shall be charged on said timbers when presented for measurement and appraisal with the sapwood still attached; and the number of cubic meters in each piece of timber so measured shall include the sapwood attached to the same, and when ebony or camagon timber from which the sapwood has been stripped is presented for measurement and appraisal, there shall be assessed and collected the following sums:

On each cubic meter of ebony ₱6. On each cubic meter of camagon ₱4.50.

The volume of all round timber shall be ascertained by multiplying the area of the small end by the length of the log. The volume of all squared timber shall be ascertained by multiplying the average cross section by the length, to which twenty-five per centum shall be added for loss in squaring. The volume of all sawn timber shall be ascertained by multiplying the average cross section by the length, to which fifteen per centum shall be added for loss in sawing.

All timber included in the preceding section in the third and fourth groups and all nonenumerated timber cut in any province, known in the market under the name of "raja" and which shall not exceed one and one-half meters in length and fifteen centimeters in diameter, shall be classed as firewood, and the following taxes shall be collected thereon:

On all firewood consisting of "rajas," from 60 cm. to 1½ met. in length, and from 7 cm. to 15 cm. in diameter, for each 1,000 "rajas."

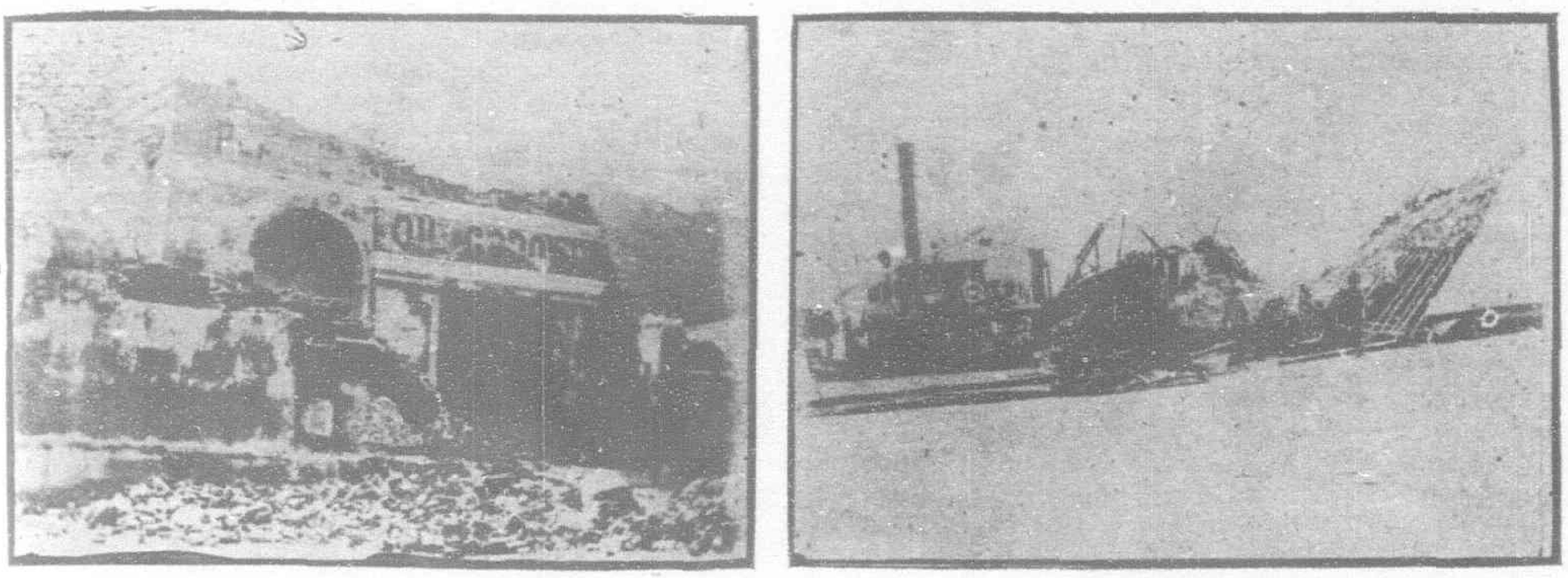
On all firewood consisting of pieces of timber less than 60 cm. in length and less than 7 cm. in diameter, ₱0.10 per cu. met.: *Provided*, That whenever in the opinion of the chief of the Bureau of Forestry the preservation and use of the public forests and forest reserves shall render necessary the removal of the tops of fallen timber, said tops when removed in accordance with the regulations prescribed by the chief of the Bureau of Forestry, shall be exempted from the payment of any tax imposed in this section on timber or fire wood or other products.

On all gums and resins and other forest products gathered or removed from any province there shall be paid on the actual market value thereof 10 *per centum*. The collector of Internal Revenue and the chief of the Bureau of Forestry shall upon the passage of this Act, and from time to time thereafter, make a joint assessment of the actual market value of the various products on which taxes are imposed in this section; said assessments shall be made from the most reliable data available and shall be published in the *Official Gazette* for the information of taxpayers.

DESTRUCTION OF SHIPPING AND DOCK PROPERTY AT HONGKONG

(Concluded from page 151.)

suffering minor damages; *Quinta*, 987 tons; slightly damaged in collision; *Sulberg*, 782 tons, damaged to the extent of $4000 in collision; *Chow Tai*, 1115 tons, badly damaged in collision; under repairs.



Photos by *Mumeya*, Hongkong.

STANDARD OIL COMPANY'S GODOWN AT KENNEDY TOWN; STAR FERRY WHARF, HONGKONG

AMERICAN—*S. P. Hitchcock*, 2086 tons, stranded with hull badly damaged and fore top mast broken, at Kowloon, near Torpedo Depot; still ashore and no salvage commenced; *I. F. Chapman*, 2013 tons, main royal mast carried away; *Hermandia*, 185 tons, badly damaged in collision; *Sorsogon*, 420 tons, foundered alongside the Kowloon Docks; salvage not yet attempted; *Rozario*, old steamer brought from the Philippines to be broken up, stranded at Yaumati Bay.

FRENCH.—*Polynêsien*, 3544 tons, slightly damaged in collision; left without repairs. *Fronde*, destroyer, badly ashore near Torpedo Depot; five lives lost; *Francisque*, destroyer, stranded and slightly damaged, near the Victoria Recration Club, Kowloon.

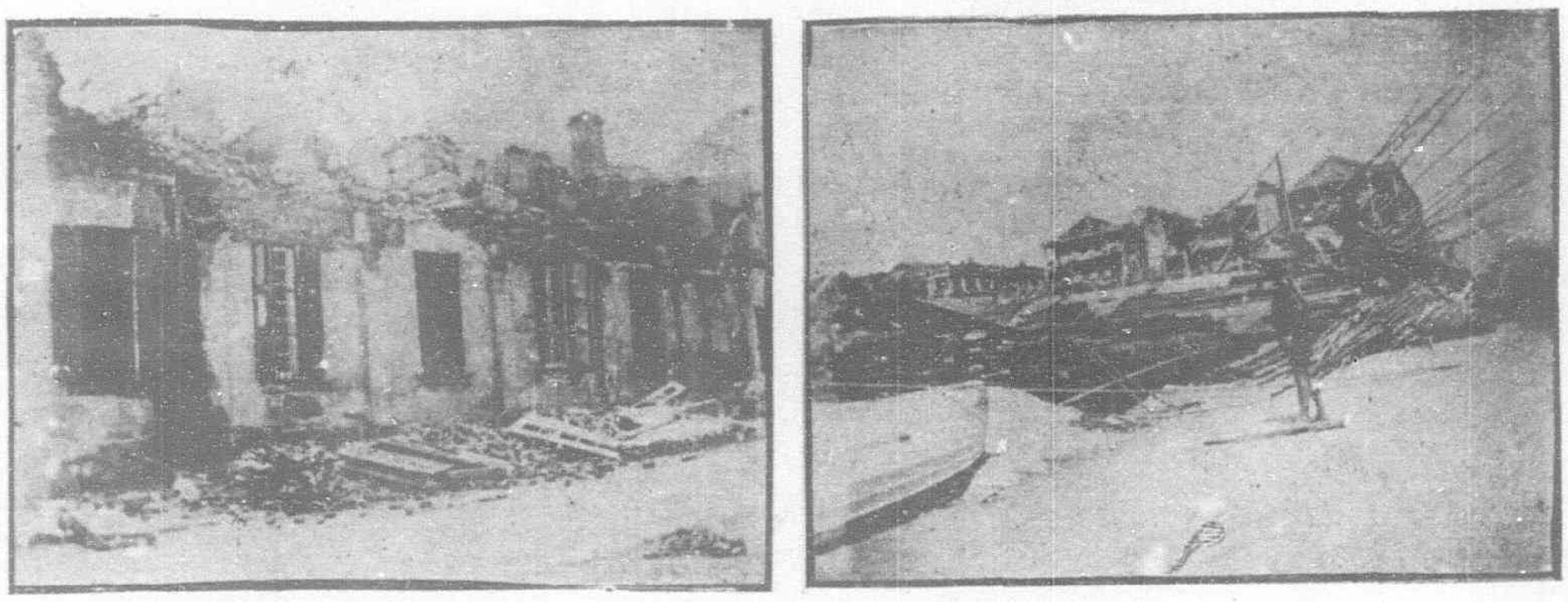
CHINESE.—Revenue schooner, 80 tons, badly ashore in Yaumati Bay; probable total loss; *Kwonglee*, 1468 tons, damaged slightly in collision; left without repairs; *Macau*, 237 tons, broken up in Yaumati Bay.

DUTCH.—*Tjiliwong*, 3062 tons, port side damaged in collision.

JAPANESE.—*Chinkai-maru*, 1564 tons, stranded and almost below water at Kellet's Island; salvage so far unsuccessful; work rendered ineffective by subsequent typhoons; *Sado-maru*, 3860 tons, slightly damaged; *Kanji-maru*, bows damaged in collision at West Point.

NORWEGIAN.—*Fri*, 860 tons, damaged in collision at the south of Stonecutters Island; *Skuld*, 947 tons, driven on the Praya wall at West Point and sustained serious damages.

MISCELLANEOUS.—*Kat On*, 160 tons, stranded in Hunghom Bay; back broken and a total loss; *Chun Kong*, 150 tons, stranded and badly damaged at Hunghom Point; *Castellano*, 178 tons, hulk intended to be broken up, stranded at Yaumati. In addition to this list of shipping many launches were lost. The Hongkong Hotel launch has disappeared completely, but some others can be raised. Ah King has had the salving of the police fleet and has raised launches No. 1 and No. 5, and work is proceeding on No. 2, ashore near Capsimun.



Photos by *Mumeya*, Hongkong.

JEBSEN & CO.'S GODOWN AT KENNEDY TOWN; BUILDING IN COURSE OF CONSTRUCTION OPPOSITE YAUMATI; FERRY LAUNCH WHARF

MANILA RAILWAY COMPANY, LTD.

The following circular has been issued from the London office of the Manila Railway Company, Ltd., to the shareholders and security holders:—

For several years past your directors have been much occupied with negotiations to settle the various claims against the United States of America arising out of the insurrection which followed the American occupation of the Philppine Islands and to rearrange the position of this company *vis-à-vis* the new Government (necessary in consequence of the altered conditions). These protracted negotiations have now been terminated, and an arrangement has been arrived at with the United States whereby, in exchange for certain advantages and a clear definition of the company's position, the Manila Railway Company surrenders its various claims against the United States. The state of uncertainty prevailing ever since the termination of the Spanish sovereignty over the Philippines has thereby come to an end. The terms of the settlement, provisionally agreed, are practically as follows:—

1. All claims against the United States Government or Philippine Commission to be waived.

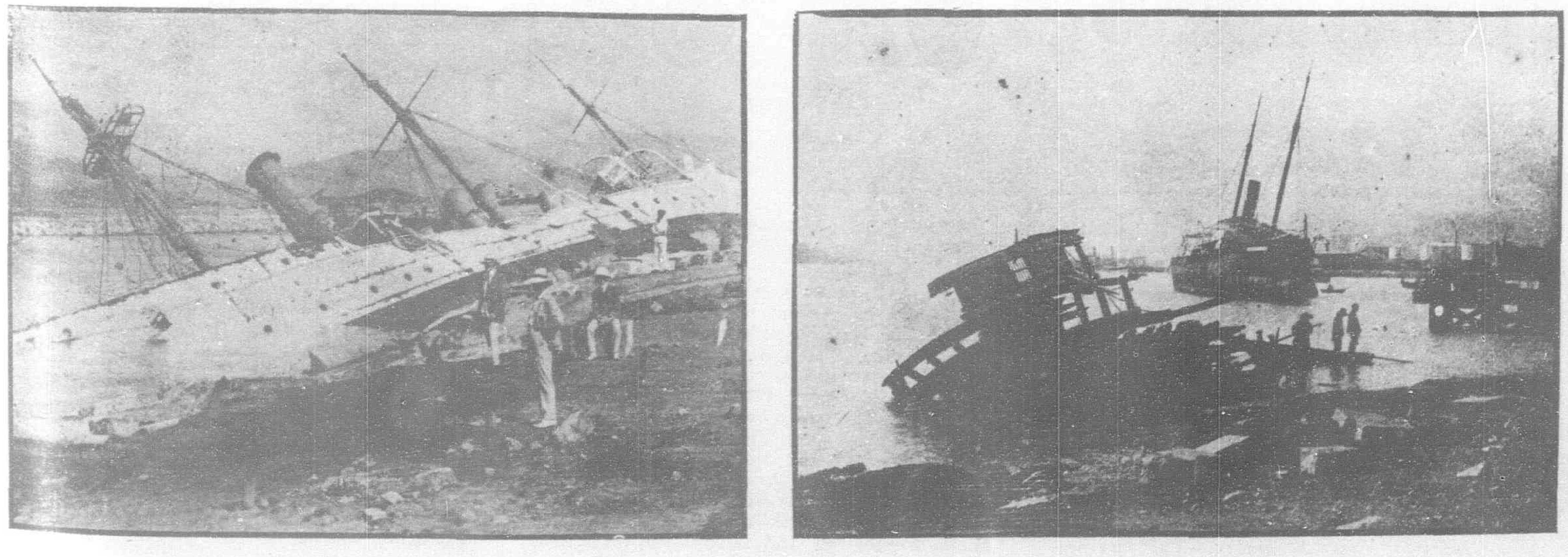
2. All claims against the railway company by the United States Government of Philippine Commission to be waived.

3. Certain reductions in connection with local taxation.

4. The cancellation of the old Spanish Concession, relieving the company of certain onerous conditions.

5. The transfer in some form of the Manila Railway Company to an American Corporation which undertakes to construct about 420 ms. of new railways which should hereafter greatly benefit your present property.

To make this agreement effective the United States Government require the consent of the various classes of stockholders of the Manila Railway Company, and to obtain this, as well as to arrange for the necessary reconstruction of the company, meetings of the shareholders and bondholders will have to be held. It was hoped that this might have been arranged before the holidays, when the position could have been explained and full details given of the various changes necessary; but it was found impossible to arrange the actual settlement of a scheme of reconstruction and make the further arrangements consequent thereon in so short a time. Your directors have therefore decided to postpone until after the holidays the meetings of the shareholders to receive the directors' report and accounts for 1905, and of the shareholders and security-holders for their decision as to the settlement with the United States.



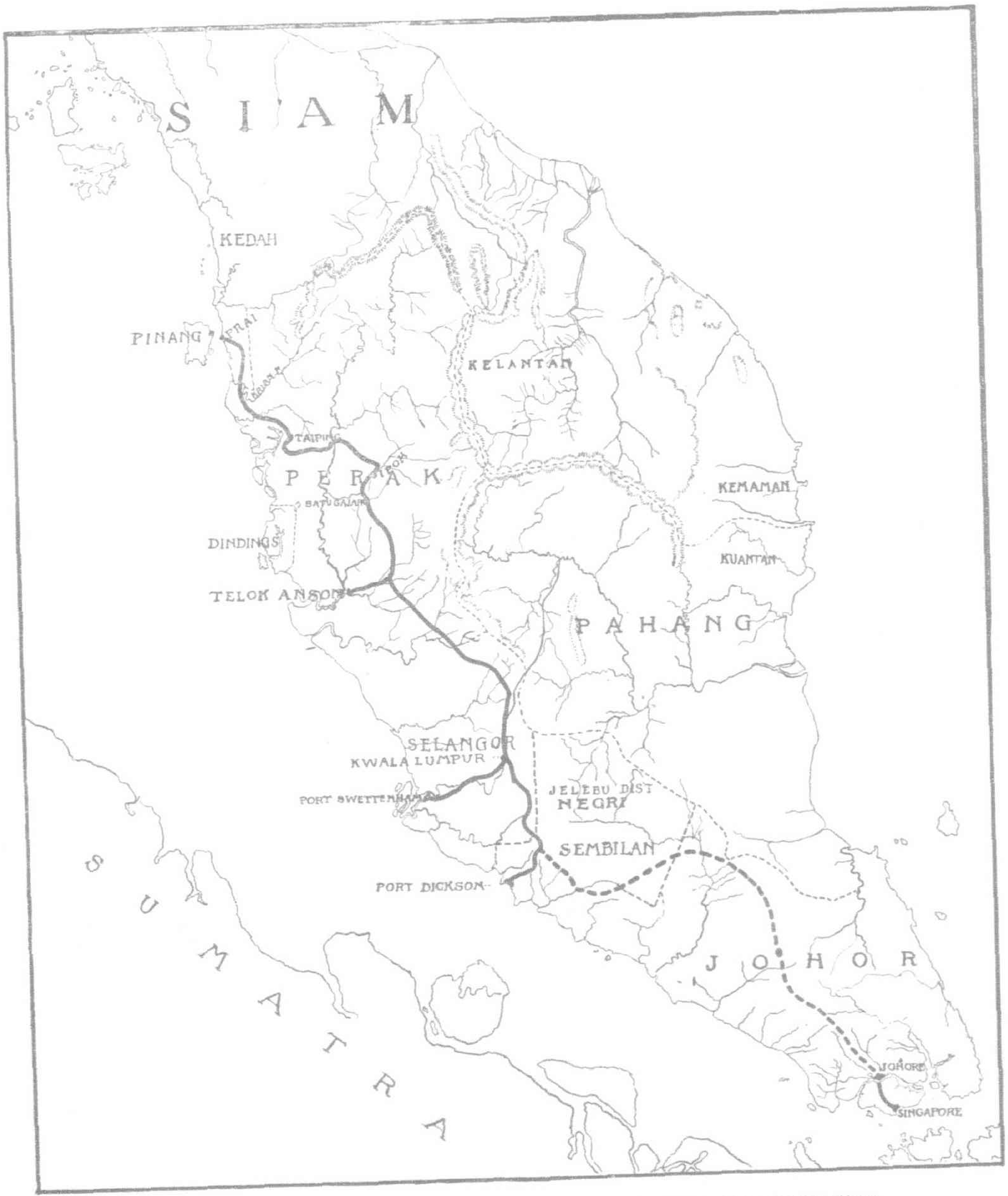
Photos by *Mumeya*, Hongkong.

H. M. S. "PHOENIX" ASHORE AT KOWLOON; LAST OF THE RIVER STEAMER "KINSHAN," BROKEN UP AT YAUMATI; STEAMER "ALABA" ASHORE NEAR BY

RAILWAY CONSTRUCTION IN THE FEDERATED MALAY STATES

The permanent survey for a light railway from Ipoh to Tronoh, in Perak, Federated Malay States, was begun in September, 1905, and at the close of the year the line had been permanently located up to the 9th mile, leaving about 2 miles more to finish. The expenditure amounted to $2.532 84.

Johore State Railway Survey.—The preliminary and permanent survey of this 120½ miles section was commenced on the 27th of March, 1904, and was completed on the 12th of September, 1905, at a cost of $172.132.83, the expenditure during the year amounting to $83,806.90.



FEDERATED MALAY STATES RAILWAYS, CONSTRUCTED AND PROJECTED

Permanent Surveys for a Light Railway from Tapah via Tapah Town Chendriang and Temoh Railway Station.—Commenced in August, 1905, and by the close of the year 5 miles had been pegged out together with a considerable amount of preliminary work over the whole distance. As it was decided to introduce a motor 'bus service from Tapah Road to Tapah Town, the permanent setting out of the line only proceeded between Temoh Station and Chendriang. The expenditure amounted to $2,458.90.

Gemas to Kuala Semantan.—This preliminary survey was commenced on the 18th of October, 1904, and completed on the 15th of April, 1905, a length of 77 miles. An alternative route between the 10th and 25th miles to avoid heavy works including 3,240 feet of tunnelling was surveyed also, with the result that all tunnelling was avoided; but the length was thereby increased by 2 miles. The survey of this alternative route was completed on the 19th of August, 1905.

The survey branches off the main trunk line at the Gemas Station and runs in a northerly direction to Kuala Semantan in the State of Pahang, where the Semantan River joins the Pahang River. This line, if constructed, will form the first section of what may be termed the East States Trunk Line—that is, a railway starting at Gemas and running through the heart of Pahang into Kelantan and possibly eventually to, say, Bangkok. The cost of this survey was $15,820, of which $14,759.36 was spent during last year and the permanent alignment is now being surveyed and staked out.

Kuala Semantan to Kuala Lipis, direct, Preliminary Survey.—This is a continuation of the East States Trunk Line as far as Kuala Tembeling and should the trunk line follow the route west of Gunong Tahan up the Tenan River, the whole of this section will form part of the main line, otherwise the length between Kuala Tembeling and Kuala Lipis will be a branch line. The survey was begun on the 5th of October, 1905, and completed for 33 miles. The expenditure was $5,921 65.

Kuala Semantan to Kuala Lipis, via Bentong, Preliminary Survey.—This is an alternative route with the endeavor of tapping the mining districts of Bentong and Raub. Work was started on the 9th of September 1905, the starting point being the 49th mile post on the Pahang Trunk Road to Kuala Lipis, and by the close of last year 46 miles has been surveyed out of a total of probably 58 miles. The survey was started from the 49th mile post as it was known that between it and Kuala Lipis or Kelantan a line is practicable. The survey was not completed and the expenditure amounted to $7,136.93.

Kuala Semantan to Kuala Kuantan.—This will form a branch line to the sea coast at the port of Kuantan, about 80 miles in length, 25 miles of which had been surveyed by the close of the year starting from Kuala Kuantan. Work started on the 18th of October, 1905, and the expenditure amounted to $4,849.

Items in the Annual Report.—The following extracts are taken from the General Manager's report for the past year:—

The earliest section of Government railways opened to traffic was in the State of Perak—namely, on June 1st, 1885, from Port Weld to Taiping. The profits on this section for the seven months ending December 31st, 1885, were $15,080.46. The earliest section opened in Selangor was on September 15th, 1886, from Bukit Kuda to Kuala Lumpur, for light traffic only. No working statistics appear to have been kept for this short period, but in 1887 the net profit for this section was $57,703,46. The aggregate amount of net profits earned between the years 1885 and 1905 amounted to $13,491,687.22, or over one-third of the present accounted capital outlay of $37,261,922.

There were eleven fatal accidents during 1905 due to persons being run over on the open line. In eight of these cases the victims were railway employees. In no instance was the railway department in fault, and in each case where an inquest was considered necessary a verdict of "accidental death" was returned. One Chinese coolie was drowned at Port Swettenham owing to his falling between ship and wharf. One Chinese passenger jumped overboard from one of the railway launches between Penang and Prai and was drowned.

The fencing of the main line and branch line to Port Swettenham was almost completed through Selangor and Negri Sembilan and 34 miles 67 chains erected in Perak and the province. Fencing in many places was shifted from wet to dry ground. The experiment made with Madras thorn for railway fencing proved a failure. The plants thrive for a short time and then gradually die out, except in a few places, notably between the central station and Sultan-st. in the town of Kuala Lumpur where the plants have grown into a fairly good hedge. This climate apparentely does not suit it.

Kuala Lipis to Kuala Kelantan.—The route explored follows the Jelai River to Kuala Tenan, up that river crossing the watershed on the Pahang-Kelantan frontier, then down the Galas River to its junction with the Kelantan River and from there passing Kuala Pergau down the left bank of the Kelantan River to its mouth at the port of Kelantan near the town of Kota Bahru. This exploration proved that a railway can be taken into Kelantan by a route west of Gunong Tahan without necessitating any steeper gradient than 1 in 100, though there would be several miles of heavy work and the line would be an expensive one to construct for from 15 to 20 miles out of its total length of 186 miles. A detailed report on this exploration was submitted to Government on September 23d, 1905.

Kuala Tembeling to Kuala Kelantan.—This was undertaken to ascertain if an easier route than the one referred to in the foregoing paragraph existed to the east of Gunong Tahan. It was found that not only would it be practicable to take a railway into Kelantan by this route, but that the distance would be shorter by 38 miles and the country traversed no more difficult than that met with on the Johore State Railway. The distance from Kuala Tembeling to Kuala Kelantan would be about 167 miles and from Gemas about 294 miles. This exploration has proved that a railway can be taken into the heart of Kelantan from Johore Bahru without necessitating any extraordinary expenditure on heavy works and that the gradients and curvature need not exceed 1 to 100 and 30 (say, 30 chains), respectively, over the whole distance of 414 miles. The cost aprpoximately would be forty-one million dollars, of which nearly twelve and a half millions is already allocated for the length in Johore. A detailed report on this exploration was forwarded to Government on the 26th February, 1906.

PUBLIC WORKS, STRAITS SETTLEMENTS

The annual report of the Public Works Department of the Straits Settlements, recently submitted to the Legislative Council of the colony, shows that the total expenditure in the department for the period, in each Settlement, was as follows:—

Singapore	$1,066 669.00
Penang (including Province Wellesley and the Dindings)	708.191,72
Malacca	271.802.39
Total	$2,046,663.11

This does not include a sum of $20,583 to meet liabilities incurred in Great Britain for which accounts have not yet been received.

Buildings.—The buildings completed at Singapore include the Central Police Station, the Court of Requests, and thedvaimtnitierAw nse Block, $16,614.08; the currency commissioners' vault, $10,286.71, and two Government residences, Goodwood, $21,021. Considerable progress was made on the new Government Printing Office, the new Tan Tock Seng Hospital, the Beri-Beri Hospital at Pasir Panjang, Raffles Museum extension, and the Victoria Bridge School. The expenditure was $45,663, $74,120, $60,000, $76,147, and $35,150 respectively. A site was purchased on the Trafalgar Estate, Yio Chu Kang-rd, for the new insane asylum for $16,500.

Public roads.—In Singapore good progress was made with the extension of the West Coast-rd, the earth formation (begun in 1904) from Pandan River to Jurong River, a distance of 1.3 ms., being completed, and the earth formation for a further extension of ½ m., from Jurong River to Bukit Damar, begun and completed during the year for an expenditure of $20,347. The total length of roads under maintenance was 89½ ms., of which 81 ms. are metalled with granite and laterite, 4¼ ms. gravelled and 4¼ ms. natural. The cost per mile was $802, $148, and $138 respectively.

In Penang, the progress made included the extension at Batu Feringgi-rd, a length of 11,130', at a cost of over $39,000.

Bridges.—As regards bridges at Singapore the report says:—A sum of $100,000 sanctioned in the estimates as a contribution to the municipality for a new bridge over the Singapore River was unexpended, no work being commenced on the new structure. Considerable progress was made with the construction of a new bridge on the West Coast-rd over the Pandan River at an expenditure of $14,462. This bridge is formed of ferro-concrete in three spans of 30' each. The platform is 20' in which supported on ferro-concrete piles. The total number of bridges on the Singapore Government-rds is 56 of which 54 are permanent structures leaving a balance of two timber bridges yet to be converted. These are on the road from the Chang-rd to Tanah Merah Kechil, a natural road. The total number of culverts comprising all of and under 10' is 240. These are all permanent structures and such of them as need repair are being attended to.

Waterworks and Dredging.—The fresh water distilling plant erected at St. John's Island and the service tank for storage accommodation came into operation during the year, the system of distributing mains and services to the various hospital wards and other buildings on the island being completed for an expenditure of $10,755.

The dredger *Mudlark* removed 60,156 tons of silt during the year from the Singapore River. The reclamation along the sea-front of the Singapore Postoffice was completed, a sum of $17,905 being spent during the year. The area of this reclamation is 71,000 sq. ft. and the cost per sq. ft. works out to $3.45, inclusive of the seawall.

Lighthouses.—Owing to the unsatisfactory progress of work in connection with the construction of a new lighthouse at One Fathom Bank and the financial difficulties of the contractor, the contract for the completion of this difficult and isolated work was re-let to Messrs. Riley Hargreaves & Co., who, after extensive preparations in collecting the necessary plant, commenced sinking the piles in December and completed seven before the close of the year, a sum of $33,289 being expended on the work. The sinking of the ferro-concrete piles by means of a double-water jet is now progressing satisfactorily. Three beacons of granite were constructed at Pulan Bukum at a cost of $1,995. All lighthouses were maintained in good order during the year.

General—The depression in trade at Singapore during the year had a corresponding effect upon building operations in the city. The average price of building materials fell about 4 per cent but the price of labor, both skilled and unskilled, continued to rise, owing to the operations of the Singapore Tramway Company and the extension of the Singapore Railway to the docks and Alexandra-rd.

The officers of the department of all ranks discharged their heavy and responsible duties satisfactorily, working early and late. In 1898, the year in which the present head of the department assumed duties, the total expenditure in the department was $659,166 and the average percentage of European and subordinate supervision 7.86. In 1905 it was $1,942,020 with a percentage of 5.20 for supervision, *i. e.*, the total expenditure in 1905 was about three times what it was in 1898, whereas the percentage of supervision had fallen from 7.86 to 5.20 or 2.66 per cent below the recognized percentage that the cost of supervision should bear to the amount expended. This fact alone bears eloquent testimony to the hard and good work done throughout the year by the officers of the department in the successful and economical execution of works entrusted to their charge.

NEW RAILWAY, BRITISH NORTH BORNEO

British capitalists are planning the construction of a railway in British North Borneo which will connect Marudu and Sandakan bays, and the company will acquire an area of 460,800 acres of land along the route. This land is suitable for tobacco and rubber and includes the valleys drained by the Bengkoka, Paitan, Sugut, and Labuk rivers. With the exception of the Paitan, which has not yet been exploited, all these rivers have been proved to contain good tobacco land, and rubber planted experimentally on the Bengkoka and the Labuk, has met with success.

The principal source of revenue for the railway, however, will undoubtedly accrue from the transport of minerals. The Labuk Valley contains almost unlimited quantities of iron ore of a quality which it is believed should permit of its export without being smelted.

The railway will traverse districts from which large quantities of rattan and other jungle produce are annually exported. From the Labuk alone the export in 1905 was valued at some $83,000. This is exclusive of salt-fish, and sea produce, which will be sea-borne to Sandakan. The collection of produce, and especially of rattan, will largely increase with the improved means of transport provided by the railway.

Timber will provide a very considerable revenue from the commencement. Whatever may be the state of the export market as regards logs, there is always a demand for sawn timber: an additional sawmill located in the timber district along the proposed route will find a ready local market, without in any way clashing with the existing mills in Sandakan and Jesselton, which already are kept constantly busy in coping with orders.

The proposed railway will revolutionize the administration of the most difficult district (as regards transport) in the State; it will cause an immediate increase in revenue from timber and jungle produce, and a permanent indirect revenue from the large number of Chinese who will be engaged in construction, and most of whom will settle in the country after completion of the railway. It will also provide a line for a telegraph which will be more easy to maintain, and less liable to interruption than that between Kaningau and Lamag which it will no doubt supersede. Finally, the natural sequence to the Sandakan-Marudu Bay Railway will be the linking up of the two systems by a connecting line from Jesselton or Tenom to Marudu Bay.—Condensed from *The British North Borneo Herald*

ANNUAL REPORT OF THE STRAITS GOVERNMENT

The report of the legislative council of the Straits Settlements, for the year 1905, has just been published and contains much information of general interest.

The revenue for the year was $11,656,153, the three settlements contributing as follows:—Singapore, $6,629,723; Penang, $2,947,482; Malacca, $2,078,948. There was an increase over the revenue collected in 1904 of $909,635, while that of 1903 was exceeded by $3,697,657. This increase is entirely due to the sale of the Malacca-Palau Sebong Railway to the Federated Malay States, the proceeds of which, amounting to $1,414,218, were placed to the credit of the Malacca revenue. The revenue proper shows a decrease of $504,583 as compared with 1904, and an increase of $2,283,438 more than the revenue of 1903. The principal increases were under the following headings:—Land sales, $1,430,129; reimbursements, $510,668; Post office receipts (including telegraph), $46,024; fees of office, $19,166; district collections, $12,509. The large increase in land sales is due to the sale of the Malacca Railway. Re-imbursements include $470,140.56 transferred from the widows and orphans pension fund to the general revenue of the colony. The chief decreases are under the headings:—Licenses, $954,795; stamps $146,481; interest, $19,374. The expenditure for the year was $11,005,137, an increase of $156,148 over that of 1904, and $2,819,185 more than the figures for 1903. The increased expenditure was incurred in the following items:—Special expenses, $745,625; lands and houses purchased, $144,248; roads, streets, etc., special services, $55,664; personal emoluments, $45,480; interest, $38,892.

The exchange value of the Straits dollar was maintained at a fairly uniform rate during the first half of the year, the lowest decreased rate being 1s. 11½d, in January and April, and the highest 1s. 11⅞d. in May. In July the dollar rose to 2s. 0¼d. and in August to 2s. 1½d. and continued to appreciate till December when it reached 2s. 1 1[16d. The average exchange for the year was 2s 0 9[16d, an advance of 1⅝d. on the average for 1905, and nearly 3½d on that of 1904. A speculative market and the difficulty of getting cover for banking operations owing to the closing of the mints to the free coinage of dollars were among the causes which accelerated the rise in the value of the Straits dollar, but the main cause was the rise in the price of tin.

The Malacca-Pulau Sebang Railway, which connects Malacca with the railway system of the Federated Malay States, was completed and opened for traffic during the year. In view of the expense of maintaining such a small section with an independent staff, an arrangement was made with the Government of the Federated Malay States, and the Malacca Railway was transferred to the Government of the Federated Malay States on payment of the total cost of construction. It is understood that the returns from traffic on the railway have been satisfactory.

MANCAYAN-SUYOC MINES AND ABRA RIVER PLACERS, LEPANTO-BONTOC PROVINCE, LUZON

(Preliminary Examination by LEONARD LEHLBACH, M. E., Manager Lepanto Mining Company, Inc.)

The Mancayan-Suyoc mineral region is in the extreme southern part of Lepanto-Bontoc Province, in the eastern center of Northern Luzon, the largest of the Philippine Islands. Mancayan is in latitude 16° 53′ N. and has practically the same longitude as Manila.

From Suyoc at the S. to the northern extremity of Mancayan the mineralized area has a length of about 7 ms. and may be said not to exceed 3 ms. in width. It lies wholly on the western slope of the Cordillera Central close to Mount Datá. The Abra river rises in NE. Suyoc flowing S. past the end of the mineral belt, then W. for a short distance, when it takes up its general northerly course, flowing through a basin formed by the Malaya Range on the W. and the Cordillera Central on the E. at about a 4 per cent grade until it reaches a somewhat broader valley at Comillas, about 5 ms. S. of Cervantes, where the gradient drops to 1 per cent. Here have been deposited some 35,000,000 or more cu. yds. of gravels which contain a large part of the gold eroded from the rich Suyoc veins.

The entire topography is made up of steep slopes, V-shaped little valleys cut by the denuding streams. None of the hills are large, none of the valleys deep. Swift flowing mountain streams are on every side, giving in the aggregate not less than 1,000 2d ft. of water in the dry season. All drain into the Abra River.

The climate is an ideal semi tropical one. The rainfall exceeds 120″ *per annum*, 90 per cent of which is precipitated between May and October. There is, however, little doubt that this is rapidly decreasing.

Mancayan at its highest point has an altitude of about 4,000′, the ridge to Suyoc slowly rising, until at its highest it attains an elevation of somewhat over 5,000′, dropping from ridge to valley on both sides some 500 to 1,000′. SE. Suyoc which is directly on the slope of Datá rises from 4,500′ at the Abra River to 7,000′ at the crest of the Cordillera.

I should judge the mean annual temperature of Suyoc to be not far from 60° F., that of Mancayan 65° and Cervantes, probably, 75° F.

The vegetation is not so densely luxuriant as might be expected although both grass and underbrush are sufficiently high and dense to make prospecting difficult. Bamboo is entirely absent.

The mountain sides are sparingly covered with a poor growth of pine and in the higher elevations with scrub oak. The former will answer for rough construction, unimportant mine timbering and charcoal. The hills in the immediate vicinity of the old Spanish workings are absolutely barren, the result of wasteful handling; but sufficient timber is comparatively near to suffice a twenty-ton smelter for many years.

The mineral district and contiguous country is but poorly populated, Lepanto Province having, according to the census of 1903, some 72,750 inhabitants, chiefly Igorots. The white population is a negligible quantity.

The district may be reached by three trails; the latest and shortest of which has a length of about 40 ms., connecting Tagudin at the coast with Cervantes by a 4′ horse trail, having a maximum 6 per cent grade. Most of the supplies have been brought in from Candon *via* Cervantes over a miserable road on pony back at a cost of 2 cts. per lb., the distance approximates 50 ms. to Cervantes over grades almost prohibitive in places. The third route, over the Central mountains to Baguio, is used only by American travelers.

The smelter site at Mancayan is some 26 ms. nearly due E. in an air line from the coast at Tagudin. A good automobile road, having a length of about 35 ms. can be constructed at a cost of less than $175,000, United States currency, which with some additional expenditure may be converted into a railroad grade for freight traffic, when necessity demands it.

January 1900 saw the advent of the first party of Americans into this region, soon followed by others. Many of these men were western prospectors discharged from our volunteer army. Others had never seen a mine before. It took but a short time for these adventurous spirits to stake the countryside for miles around. They organized a mining district, adopting *in toto* the American mining laws. They formed themselves into parties, their "bad men" as usual ordering some of the weaker ones to pull up their stakes and get out. It is surprising that there was no bloodshed. Time passed, things became calmer, provisions and money gave out. You can not develop and operate a copper mine 7,000 ms. from a smelter without considerable capital. Many of the old faces, including mostly the "bad men," disappeared. A few new ones came in. The act of congress, relative to the location of mining claims, approved July 1st, 1902, was promulgated and once more the Americans staked out their claims. The entire surface of the country is covered, excepting in the stream beds, with a heavy trachyte flow that made poor man's prospecting out of the question. I have stated that there was no money. Some of the Americans turned their attention to neighboring Suyoc with its rich gold veins. Two fortunate fellows found a pocket worth $3000. Many eked out a miserable existence living on the native sweet potato. Others living by doing the assessment work for absentee claimholders. The conditions today are unchanged. About 60 claims are held in the district by these men with a full and sublime confidence that sooner or later capital must come their way. In all these years they have made no single serious attempt nor have they gone one jot out of their way to look for it.

Suyoc has always been a gold rather than a copper camp. Today the desultory labor of a few Igorots produces more than 1500 ozs. *per annum*.

These poverty-stricken prospectors have been for 6 yrs. living within a few miles of 35,000,000 cu. yds. of pay gravel, much of which (the shallower reconcentrated areas) is rich enough to have enabled a white man aided by the cheap Igorot labor to make good money. Few of these men but have passed through the 4 ms. of these placers a score of times. All of them must have known that the gold eroded from the rich Suyoc veins had no other outlet than the Abra River and that, until it reached the broad flat valley of Comillas, was too steep to precipitate the gold it carried. Several of the men have since told me that they often thought of prospecting the benches, but they never did. It remained for a stranger to the district, to, with his friends, take it up. The following dry season will probably see it thoroughly prospected. The writer having spent a month in surveying and examining these placers believes that they will be found of very considerable value.

GEOLOGY.—A comprehensive geological study of the Lepanto mineral district would of necessity require the reconnoissance of a region containing quite 1500 sq. ms. A territory at present almost entirely unsurveyed. So lenghty a field study as this comes not well within the province of a mining engineer's duties but is properly for the trained government geologist.

Few explorers have visited this region in the past. Hernandez in 1855 spent 17 days in the mountains and on his return first excited public interest in Mancayan. He, however, attempted no more than an examination of the one ore occurrence which was then a mere prospect.

Santos who from 1864 to 1875 so abld managed the Mancayan copper mines paiy little or no attention to the geology a mile away. The able von Drasche passed through the country in 1875 on a rapid reconnoissance of a very large area. He had no maps and could do little more than make a superficial examination. Mr. Becker of the U. S. Geological Survey made a trip around the islands of the Archipelago in a gunboat, it being hardly safe at that time to travel any other way. He could not as he explains it go further inland than the boat's guns could shoot. He picked up on the coast and rivers pebbles and boulders. They told him quite a story. Returning to America he compiled what all the other writers had to say with what he gathered in his trip and made many excellent deductions therefrom, which are published in the 21st Annual Report of the U. S. G. S.

In the winter of 1903-4 Mr. A. J. Eveland, Geologist of the Philippine Mining Bureau, made the first systematic study of the district but, naturally, only a preliminary report was justified. His report appears as Bulletin No. 4 of the Mining Bureau as "A Preliminary Reconnoissance of the Mancayan-Suyoc Mineral Region."

My three months of field work were not intended as a geological study in more than the preliminary examination of the Mancayan copper mines, the Suyoc gold and copper prospects and the Abra River placers necessitated the securing at first hand sufficient reliable data to enable me to venture with some measure of safety a theory of the genesis of the ores, their probable extent and continuity.

I lacked a topographic map and did not make a complete survey of the district as I expected to receive in ample time the new map prepared by the Mining Bureau; unfortunately, however, lack of lithographic facilities in Manila has delayed its appearance. I drew a rough map on which, aided by the miners, were drawn all the claims located, the roads, trails, rivers and prominent objects. This took a day or so and, rough as it was, sufficed for my needs. A hasty compass survey of SE. Suyoc, a compilation from a Spanish map of Mancayan, a plan of the under ground workings at Mancayan, kindly sent me by the Mining Bureau, and a transit and stadia survey I made of the Abra River placers left me little to want for.

The known mineral areas of economic importance in Northern Luzon may be said not to exceed 3 ms. in width, they are usually much longer, all lie on the western slope of the Cordillera Central. Commencing with the southern most Benguet field a line bearing N. 23° E. would closely bisect all of them. Between them stretch long areas of apparently barren regions. There is sufficient similarity in all the ore occurrences of Lepanto and Benguet provinces, most of which I have visited, to warrant the assumption that in all probability the same common causes that created deposits in one place caused deposits in all.

Diorite is the underlying rock in Lepanto as in Benguet. Several igneous intrusions have taken place. A wide granite intrusion some 12 ms., possibly much more, in length marks clearly the western limit of ore deposition for both Mancayan and Suyoc. East of this hornblende-granite intrusion in the basal diorite are several occurrences of the outcropping of rhyolite or quartz-porphyry intrusions, either one fairly large mass or three separate dikes. I incline to the belief that further development will prove them to be three vents to the one intrusion. The general strike of all the igneous intrusions is N. 20° W., the dip E. and varying from 10° to almost vertical and with many indications of steepening at depth. In SE. Suyoc the Copper Queen Creek has cut its way through a mass of dioritic conglomerate of great thickness, this is undoubtedly the same rock von Drasche describes as the

"Agno Beds" as "consisting in the lower portions of coarse breccias and conglomerates of dioritic rocks, very coarsely bedded, with pebbles often of enormous size." I quote from Mr. Eveland:—"Regarding ages of these rocks nothing can be said excepting the deductions already made by others......von Drasche first classed them as primitive, then Paleozoic. Later Abella seems to have obtained fossils in the upper strata, of shells of surviving sepecies, and lignite, and adopts the hypothesis that these 'Agno Beds' represent the basal conglomerate formed during the Miocene subsidence of the Philippine Group." These descriptions leave little for me to add under this heading, but as they are the source of ore deposits of considerable magnitude not hitherto written about I shall speak of them at some length under the proper caption.

In the extreme southern end of Suyoc but on the western slope of the Cordillera is an occurrence of basalt which also is the depository of rich, although possibly not large, ore bodies. Overlying the conglomerate north of the Copper Queen Creek I find a 12′ seam of clay underlying a thin sheet of trachyte.

The entire togography is covered with a trachyte flow. Von Drasche calls it sanadine-hornblende-quartz-trachyte, Mr. Eveland is more modest, or has a greater idea of the economy of space, and simply says trachyte. The shorter name will suffice. Mr. Eveland further speaks of it as being a rock of the utmost importance as having a direct bearing on the ore deposition of Mancayan. I can not in this agree with him. I will go into the matter more fully under "Genesis of the Ore." The trachyte as studied all over the district seems to be a flow of very recent date from the E., most likely from Mt. Datá which I see no reason to doubt was not very long ago an active volcano although I agree with Mr. Eveland in that it very likely is "the residual mass left by erosion of the eastern limb of the broken anticlinal arch, and added to by latter volcanic action." The entire district I have stated elsewhere is cut by many swift flowing streams, all of which have cut their beds in the rocks underlying the trachyte. Southern Suyoc shows me clearly that at the time of the trachyte flow there existed a topography not much different from the present, and in that district the general contour of the trachyte-conglomerate contact follows very closely that of the usual water line. The trachyte is thickest at the mountain crests and shades to nothing in the valleys. The rock itself can only be called a rock by the technical courtesy that classes water a rock because it is made up of mineral molecules. It is a much decomposed gritty crumbling mass, sometimes almost earthy, at other times ashy in appearance with large phenocrysts that aggregate more than the ground mass, in no instance that I have so far been able to find does it have a depth of 200′

Hot springs in great number are met with in Benguet S. of these ore deposits and near Cervantes, N. of them. These springs contain chlorine, sodium, and other solvents.

Briefly, then, a glance at the attached sections will give the general geology. A is a section through the ore deposits of Mancayan bearing, N. 45° E., it shows an underlying diorite intruded by granite and quartz-porphyry intrusions, the latter for some 200′ of width containing lenticular masses of tetrahedrite, enargite and other locally less important minerals. Covering all excepting at the granite and porphyry outcrops and the river bottoms is a mass of trachyte. B. is a section through the Palidan and Gatugat Slides, old Igorot workings in which there is among the natives considerable activity today. This bears S. 72° E. cutting through the Rogers, Igorot, Montana, Gatugat and Laura claims. Again we have the underlying diorite, the granite intrusion, here, is a considerable distance west of the commencement of the section, also the same quartz-porphyry intrusions and the same trachyte capping. The ore occurrences are however much different as will be spoken of later. C is a section through southern-most Suyoc bearing S. 45° E. Here also underlying diorite, the granite again too far W. to have place on the section, the trachyte capping, the quartz porphyry intrusions but no ore deposition shown until the eastern bank of the Abra River is reached when in diorite are several small veins of rich gold, lead and zinc content and last of all in the coarse conglomerate which here by the grinding action of faulting has been brecciated exceedingly fine, the lines of the minor faults filled by replacement with quartz veins.

The Abra River placers are dry benches formed by the eroding and corrading action of the heavy precipitation in the Suyoc region, the corraded matter being carried down by the numerous small streams to the Abra River which entirely encircling Suyoc is the only drainage the district has. At the time of the formation of these placers the annual precipitation was likely twice the present 120 to 150″, the gradient of the Abra River from and through Suyoc to the Comillas Valley is closely 4 per cent, too great to permit of the precipitation of the metal carried in suspension. Over the 4 ms. the placers extend the gradient has dropped to slightly less than 1 per cent. The river has made its way through an overlying trachyte quickly down to the underlying granite, basalt diorite, carrying with it in times of flood many large boulders, approximately 5 per cent of the volume of gravel is in pebbles of from 9″ to 3′ in diameter. These have acted as riffles, allowing but little gold to escape below the flat. A survey of the benches shows three main channels that at different periods have been the river's beds. It would seem that firstly the bed was from 2,000 to 4,000′ W. of its present one, this became filled up with gravel to a depth, shown by exposures of, in places, 50′, then a new channel was cut lower down to the E. into which, besides the gravels carried down from Suyoc, were reconcentrated a part of the gravels from the older bench, the same thing has happened three times. Two cross-cutting streams, as may be seen by reference to the accompanying map of the placers, have reconcentrated still further, large areas. I speak of these placers under a separate head at greater length.

GENESIS OF THE ORE.—It is somewhat early to venture an authoritative statement anent the genesis of the Mancayan Suyoc ores. I propose to give the facts and hazard the theory I deduce from them. It will be some years hence, after diamond drills, shafts and tunnels have penetrated far into the bowels of Mother Earth, before the genesis of these ores can be authoritatively given.

Some 30 odd ms. S. of and 10 ms. N. of this region are noticeable many hot springs, bubbling forth from unknown depths, their heated waters charged with chlorine, sodium and other minerals.

The basal diorite of Lepanto, as of Benguet, has been intruded by long narrow dykes of igneous matter, prominent among which is a strong occurrence of rhyolitic quartz porphyry. The entire region has been the center of many and repeated shattering shakes. In places, generally parallel to four directions from N. 8° E. to E. These slips have resulted in the formation of brecciated zones of considerable length and breadth, finest always, of course, in the central parts.

The Mancayan deposits consist, so far as present development shows, of lenticular masses of enargite and tetrahedrite, there being frequently associated with the latter chalcopyrite, these minerals are contained in a calcareous quartz gangue which frequently does not comprise ten per cent of the mass. Here and there throughout the mine covellite, and more sparingly, some other of the copper minerals are observable. Outside the lines of the ore shoot the quartz porphyry dike is found in places to be of medium grade copper value containing gray copper ores as small islands in parts of its mass and as the lining or filling of small seams The lenses vary in size, from one several hundred feet in length by 20′ in width and an unknown depth to others, little fellows, not much larger than cracks. All occur within the quartz porphyry intrusion and within the confining walls of a chimney or shoot some 200′ wide by an indefinite depth, striking in a general SE. direction at a low dip from the horizontal. These lenses are invariably parallel to the well defined lines of the numerous minor fault seams. Their quartz gangue plainly shows its origin to have been through the replacement of another mineral. I believe that closer examination will show the entire set of lenses to be connected one to another by thin seams or crevices of material similar to that they contain and that through these channels the heated rising waters have penetrated carrying from greater depth silicious solutions well charged with the elements that form the copper minerals. These waters travelled upwards until they reached a zone where the pressure that forced them no longer was so strongly felt when the deposition of their minerals and the replacement and enlargement of the cracks commenced.

Let us return now to the time of the quartz porphyry intrusion. An acidic mass from 500 to 1500′ in thickness and more than 35,000′ in length was forced upward through the diorite in a line parallel to the earlier granite intrusion and east of it. A plastic, almost fluid mass, such as this must have been, follows the line of least resistance in coming to the surface, here this was a weakened or shattered zone, a long narrow area of crushed rock, caused by the granite intrusion. It rose to the surface. In different parts of its length it cooled at varying temperatures and, possibly, was affected by other conditions, evidenced by the different textures of the rock, the great differences in crystallization and phenocrysts and the lack of them. In cooling it contracted, causing fissures and cracks which soon became the ready channels for the escaping vapors, gases and waters driven off by the heated mass from its lower and more slowly cooling regions. These vapors, gases and waters were probably fumeroles that died out soonest at the highest elevations. They live today as the hot springs of the N. and S. at elevations of from 500 to 2500′. This intrusion caused fissures and cracks to its east as did the granite intrusion before it. These in Suyoc have been filled, or possibly by replacement of their walls enlarged, into several veins, one several thousand feet long and of strong width, others much smaller, and while not absolutely parallel to the dikes never forming more than a small acute angle with them. The repeated shaking and shattering and minor faulting caused more fissuring, much fracturing, and considerable brecciation. All favorable to and used by the percolating waters in effecting their task of ore deposition.

It should be remembered that nearly the entire topography of the district is covered by a thin trachyte capping which completely hides from us the secrets of Nature's store house, other than is shown us where the swift flowing streams have hewn their beds through, into the more solid rocks, exposing an occasional ore deposit. There is therefore no reason to doubt that further exploration beneath this cap will result in the discovery of other ore deposits or rather other parts of this great one. That we know here now is but the index finger that has been so kindly pointed for us.

In SE. Suyoc the Conglomerate beds were faulted by three or more minor slips or faults, having a general NE-SW direction, resulting in fine brecciation of the diorite pebbles. Here causes, similar to those at work in Suyoc, caused but slightly different results. The brecciation was of sufficient length to have permitted the formation of veins instead of lenses.

CHARACTER OF THE ORE.—The Mancayan ores are gray copper ores, principally enargite and tetrahedrite, the latter frequently associated, with chalcopyrite and in the lowest level of the mine overlying a large deposit of enargite I found a considerable quantity of covellite embedded in enargite. In much lesser quantity are to be found tenantite and malachite. As stated under genesis these ores are contained in a calcareous quartz gangue. The mine also contains large quantities of pyritous ores worth some $5 in gold per ton, contained in a similar gangue. Associated with the enargite is a small percentage of zinc. All the minerals seem to carry small gold and silver values, but I have not so far ascertained the exact relationship.

Suyoc in the main dike contains exactly similar ores to Mancayan but, owing to the more limited development of the district, the quantities in sight are much smaller and probably development will prove the lenses to be smaller than in Mancayan.

West of the main dike occur small veins of a calcareous quartz carrying sphalerite, galenite, bornonite, gray copper and free gold.

East of the main dike are strong occurrences of a calcareous quartz vein carrying pyrite and free gold with a hanger rich in copper sulphides. Here also are many occurrences of weak veins carrying galenite, sphalerite, many of the copper sulphides, pyrite, marcasite, and free gold. The Palidan and Cayan Slides which contain large quantities of debris from the old Igorot workings and from erosion, contain, as also some other parts of the district, small occurrences of gypsum which is of no economic importance and probably owes its origin to the action of sulphuric acid from the decomposing sulphides on the calcareous matter of the gangue.

The strong quartz replacement vein of SE. Suyoc which is in the brecciated dioritic conglomerate consists of a quartz gangue heavy in calcite. The principal minerals are chalcopyrite, tetrahedrite, several undetermined silver minerals, pyrite and gold. In addition, but of small economic importance, are many of the copper minerals including chacocite and some tenorite. Every assay of ore in this vein so far has carried in excess of 8 per cent cu., 12 oz. ag. and 0.10 oz. au. per ton.

Earlier in this chapter I ventured the hypothesis that ascending waters had deposited their mineral freight close to the surface. I by no means am to be misunderstood as saying that the deposits are superficial ones but that in my opinion it will be found that at depth values will become less until at something like 2000′ it is probable pay values will cease. *Should, however, these deposits continue to 1000′ at 50 per cent of their present value this will be one of the world's richest copper camps.* I believe that the secondary sulphide enrichment of Mancayan is simply the result of a continuation of the process of ore deposition until having deposited in an original form as chalcopyrite the ores were worked over again until the present very rich sulphides resulted, not necessarily at the expense of the levels immediately below but possibly carried up from the same depths that sent up the first mineral. It is, however, also possible that this concentration has been effected through either robbing the ores immediately below or from minerals contained in eroded thousands of feet above. There is now an annual precipitation of over 120″ falling on very steep slopes which may mean that descending waters have caused the zone of secondary enrichment.

OCCURRENCE OF THE ORE.—Present development shows rich ore deposits of probable magnitude at the Lepanto and Bontoc claims, the old Spanish copper mines, in Mancayan, the Cayan, Palidan, Gatugat and Quien Sabe workings of Central Suyoc and the Copper Queen Creek and Gobossen workings of SE. Suyoc.

The center of Mancayan from a mining standpoint, is the large ore body of the Lepanto and Bontoc claims. This is partially developed by some 6000′ or more of underground workings, galleries, winzes and stopes, which prove the existence of the strong shoot described in the last chapter. Mr. Eveland states in his report on the district:—"One important observation is worth recording: The lowest tunnel, a regular and large gallery, driven for drainage, has in its present length, and in the side drifts, which are under the greater part of the other workings, no sign of ore—in decided contrast to the rich values of a few feet above; the explanation of this is not certain." This does not agree with the facts as I have found them. Unfortunately this part of the mine at the time of Mr. Eveland's visit was in such a condition as to preclude the possibility of a thorough examination. The side galleries draining the richer parts of the mine were filled with a solid gossan to within a foot of their top. The richest parts of the mine are several hundred feet, E. of this drainage tunnel and no attempt was ever made by the Spaniards to use it for other than drainage purposes. A closer study of the deposit shows that while the ore occurs within the quartz porphyry dike, it is unlikely it would, as gray copper ore, assaying 16 per cent cu., occur throughout every part of a mass 1000′ in width. It may in fact be seen that ore occurs here only within the walls of a chimney approximating 200′ in width, dipping some 10^0 from the horizontal downward in a southeasterly direction, showing evidences of greater strength towards the S. Furthermore I have found several occurrences of small seams of rich enargite within the drainage tunnel; and its walls over a considerable part of their length carry or are a low grade copper ore. The side galleries leading from it were Sr. Santos' drainage system for the mine and nolateral drifts have been run from them in search of ore. From their location I should unhesitatingly declare them to lie W. of the probable ore zone, not under it. I may also say that my richest samples have been taken from the lowest levels of the mine where large bodies of high grade ore exist.

The result of 36 yrs. of Spanish operations with a crude Mexican smelter is the accumulation of dumps containing approximately 100,000 tons of ore worth about $20 gold per ton, with possibly as much more, the result of the same and previous native operations, spread out along the Mancayan River in the Copper Placer claim.

On the Tombstone and Orient claims immediately NW. of the Bontoc claim are several exposures of low grade copper ore. It is improbable that the rich ore shoot above mentioned will extend so far N. as its full strength seems to come from the S. Still further N., about a mile or so a prospecting tunnel has cut into low grade copper ore. No attempt has been made since its discovery, several years ago, to prospect it further, and, while it may possibly in years to come be found to contain a body of ore, for the purpose of estimating future possibilities we may forget it.

The Keystone claim lies SE. of and immediately adjoining the Lepanto claim and as I have previously stated the full strength of the ore shoot goes towards it and prospecting tunnels have located ore there. Whether this ore shoot goes beyond the southern boundary of the Keystone claim or not is problematical. Dipping as it does at 10^0 or somewhat more a diamond drill hole would find it on the adjoining claim, the Manila American, at a depth of about 800′, allowing for the difference in elevation of the surface.

Beyond this I doubt there will ever be found an economic occurrence of copper ore until Tuboc is reached. Here I have not been favorably impressed, but the claim holders are energetically pushing development and report to me having cut through the trachyte by their tunnels into the quartz porphyry dike and that they have found ore. Unfortunately the tunnel in which this happened was allowed to cave before I could examine it, and at the time of writing has not been taken up.

At Cayan we reach a different class of ore occurrences, those characteristic of Suyoc. Here undoubtedly are many occurrences in leads, more or less strong, of copper and pyritous ores in silicious and gypsum gangues. The latter certainly superficial deposits, the former more likely leaders from or to a larger deposit not yet opened up.

Palidan presents an ore deposit of considerable magnitude, opened up by Igorot gopher holes and erosion over some 1200′ in length. It is in appearance a slide, some 1200′ or more across the top, maintaining a fairly uniform width to the bottom some thousand feet or so lower, on about a 45^0 slope, pierced here and there with numerous small galleries. In the dry season viewed, at a distance of a few miles it glistens in the sunlight with all the beautiful colors of peacock ore. Close at hand it is found to be an enormous dump and talus heap, containing undoubtedly much low grade copper throughout and causing the miner immediately to speculate as to whether concentration could not be made to give up its possible value. A closer inspection of the little gopher holes shows that they have been run in following rich leads of tetrahedrite, bornonite, and in one instance a well defined strong lead, close to the western terminus of the slide, of galena. All have been found in lenticular pockets, to be rich in free gold. This should be the scene of determined development work. There is no doubt that a large ore body exists, but in its present state of development and ownership nothing can be done with it. These conditions will undoubtedly better in time and it may then become a rich center of Suyoc. Gatugat, 1000′ away, is the same thing on a smaller scale, but fortunately without the troubles of complicated ownership. At the foot of the Gatugat workings for several thousand feet stretches the Quien Sabe vein, which on the Quien Sabe claim, of Mr. Albert P. Wright, has in past years been the scene of great activity and production in free gold. The vein is a strong one, the strongest of the district. Its main body, a whitish calcareous quartz, carries gold and some pyrite, the brecciated hanger, good copper values. It is to be hoped that no time will be lost in developing this and the adjoining claims as they offer considerable future promise. On the Laura claim of Mr. C. A. Pettit, somewhat close to the northern end of this vein and in the quartz porphyry dike, in lenses, I have taken some rich samples of copper ores: lack of development prevents my saying more than that it looks good.

Between this and Copper Queen Creek are several occurrences of small veins in the diorite country. These carry copper, lead, and zinc sulphides of an appearance to indicate origin through surface waters, also free gold.

In Southern Suyoc, Copper Queen Creek has cut its course through the conglomerate beds described elsewhere, exposing one strong quartz vein some 4 to 6′ wide. This is called, locally, the Copper Queen vein, and in the Anaconda and Elizabeth claims, one on either bank of the creek, has by tunnels into the mountain along the vein been proven over some 800′ of length. It is probable that the ore shoot continues beyond in both directions but it can not be estimated how far. In the breast of all four tunnels it seems as strong as in the center. Over all its length samples have been taken showing it to be rich in copper, silver and gold. Some few hundred feet further up the creek are similar exposures of rich ore but in weaker veins.

The general strike of these occurrences is NE.-SW. and some 2,000′ SW. in the direct line of strike are the old Gobossen workings comprised now in the Gobossen claim. From these, in the past, considerable gold has been taken. Like the Palidan and Gatugat workings it will here be necessary to do considerable prospecting and development before an idea may be formed of the probable value of the deposits.

The entire district may be said to be in its infancy, while it has been known that minerals exist here, for many years, and while for 5 yrs. American prospectors have been at work, there has never been excited the interest of capitalists, very likely for no other reason than that the field has never been properly or at the proper time placed before them. There is every reason to believe that future development work will succeed in opening up, not only the deposits I have described, but others, at present hidden by the trachyte capping and not now dreamed of. Also the outlying portions of the district, especially to the east, will be prospected and certainly offer encouragement. It must however always be strongly borne in mind that this is not a poor man's district and that either prospecting or development without strong financial backing is but financial suicide.

(To be continued.)

HON. W. MORGAN SHUSTER,

Member of the United States Philippine Commission and Secretary of Public Instruction

YANGTSZE RIVER STEAMER "LOONG-WO"

There was recently completed at the yards of the Hongkong and Whampoa Dock Company, Ltd., Hongkong, the magnificent steel twin-screw river steamer *Loong-Wo*, of 3,923 tons gross and 2,386 tons net register, built to the order of the Indo-China Steam Navigation Company, Ltd., Messrs. Jardine, Matheson & Co., general managers. She is a sister ship of the same owner's steamer *Tuck-Wo*, turned out at the works of the London and Glasgow Engineering and Iron Shipbuilding Company, Ltd., Govan, Glasgow.

The *Loong-Wo* is now plying in the Yangtsze River passenger and cargo trade. She is the largest vessel so far constructed in China, and is unrivalled in point of sumptuous and luxurious furnishings. Taking into consideration that all material had to be imported, it reflects great credit on the officials of the Hongkong and Whampoa Dock Company, Ltd., to have built and engined a vessel of her size and class well within the contract time of 11 mos., which compares most favorably with builders in Great Britain. The excellent workmanship and material that the dock company is in the habit of turning out is well known throughout the Far East, and is evidenced in the construction of the steamers *Kinshan*, *Kinling*, the U. S. S. *Fathomer*, and numerous other craft, as well as in the large repairs of all kinds the company is constantly effecting in vessels of every description, from leviathan battleships to steam launches.

The principal dimensions of the *Loong-Wo* are as follows:—

Length between perpendiculars	330′
Length over all	342′
Breadth, moulded at main deck	46′
Breadth over guards	58′
Depth, moulded to main deck at side	15′ 6″
Height, main to upper deck	9′
Height, upper to promenade deck	7′ 3″

The hull, which is of Siemens-Martin mild steel to Lloyd's test, has a dead-weight carrying capacity of 1,800 tons on 12′ mean draft in fresh water, and when so loaded is capable of maintaining an average speed 13 ½ knots.

There are three decks—main, upper and promenade. The accommodations for Chinese passengers is on the upper deck and that for whites on the promenade deck. The smoking room is situated on the promenade deck aft.

The machinery consists of twin-screw, tri-compound, direct-acting engines on the Yarrow-Schlick-Tweedy system—triple-expansion surface-condensing—each set having four inverted, direct-acting steam cylinders, bolted together side by side and working on 4-throw crank shaft. The high-pressure and mean-pressure cylinders are placed between the two low-pressure cylinders. The diameters of the engines are 17″, 28″, 31½″ (2) by 33″ stroke. Their working pressure is 180 lbs. per sq. in.

There are two boilers of Siemens-Martin mild steel, 15′6″ mean diameter by 11′6″ long, designed and constructed for a working pressure of 180 lbs. per sq. in., in accordance with Board of Trade requirements. Their heating surface is about 5,400 sq. ft., and grate area 135′. Each boiler is fitted with four Brown's furnaces. There is also one donkey boiler, 8′ diameter by 8′ long by 85 lbs. pressure. Howden's system of forced draught is also a feature.

The vessel is lighted throughout by electricity, the installation consisting of two 15-kw. 100-volt sets, by Messrs. Clarke, Chapman & Co. Electric fans are fitted in all staterooms for both whites and Chinese, the saloons and smoking rooms; also a complete set of electric bells.

A feature of the steamer is the almost entire absence of vibration when under steam.

"INTERESTING MANILA"

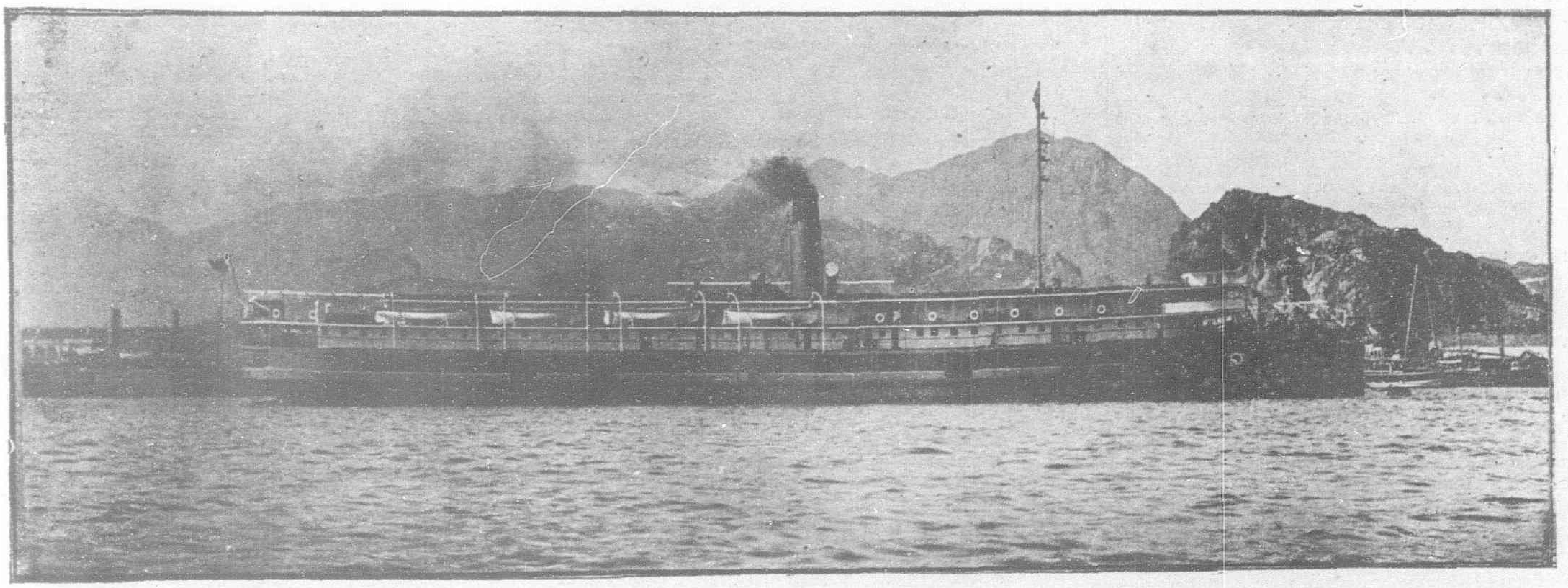
[*Interesting Manila* (second edition), by GEORGE A. MILLER, author of *Ruins and Romance of Guadalupe* and *Things Worth Seeing in Manila*. Press of E. C McCullough & Co., Inc., Manila.]

In his preface to the publication, the author says:—"This second edition of *Interesting Manila* is issued in response to a demand which exhausted the first edition within three months. Much new material is added to the old, and the illustrations are nearly all new and many of them appear on these pages for the first time. These sketches are offered as a faithful and unprejudiced account of customs, habits and objects of interest peculiar to a life rich in that oriental flavor so fascinating to the pilgrim from the great West. Of the multitude that has come to these shores, few have suspected the existence of the treasures hidden behind the old walls, and many a dreary day might have been brightened by visiting some of these most interesting historical spots. This volume may serve a double purpose. As a key to Manila it may unlock many doors of walls that hide things worth seeing. As a souvenir of the city and description of its life, it may supply detailed and accurate information for friends at home. The writing of many letters is a weariness to the flesh, and as flights of imagination have been eliminated from these pages, the data here assembled may be taken as authentic."

Interesting Manila is profusely illustrated with halftone cuts and sketches in black and white. The book is very neatly bound, is printed on fine super book paper, in clear bold type, and altogether it should be a credit and a valuable addition to any library. For sale by E. C. McCullough & Co., Inc., and all book dealers in Manila. Price $1.50 gold per copy.

"PURIFINE"

Messrs. Denniston & Stanfield, Room 15, Paris Building, 34 Escolta, Manila, have been appointed sole agents in the Philippine Islands for "Purifine," an odorless and non-poisonous disinfectant, which gives promise of becoming very popular with sanitary engineers and others in the territory their representation covers. In addition to its most appreciable qualities already mentioned, "Purifine" will not burn nor stain. It does not change in effectiveness by exposure and it has no sediment to choke waste pipes, while it may be diluted for personal use in any kind of water, even salt water, to any weakness desired. "Purifine" is highly recommended by the health departments of many leading cities, as well as the management of numerous large and private hospitals. In view of its high reputation, sanitary engineers and the health departments of the cities of the Orient can not help but look upon it with favor.



YANGTSZE RIVER STEAMER *LOONG-WO*, BUILT BY THE HONGKONG AND WHAMPOA DOCK COMPANY, LTD.

FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

RAILWAYS AND RAILWAY SUPPLIES

Manila Railway Company, Ltd.—The London offices of this company have been removed to No. 7 Union Court, Old Broad-st, E. C.

Mukden-Sinmintun Railway.—This line has been opened to traffic. The distance between the termini is 36 ms., time to cover it 3 hrs. 20 mins.

Korsakoff-Vladimirovka Railway, Saghalien.—This railway, which is in the Japanese portion of the Island of Saghalien, is about completed.

Canton-Hankow Railway.—Taotai Kwang Sing Chi is the new manager of works for this line, and has entered upon his duties with headquarters at Canton.

Tatsuno-cho-Aboshi Harbor Line, Japan.—The construction of this line in the Prefecture of Hyogo, covering about 6 ms., has been sanctioned by the Tokyo Government.

Seoul-Fusan Railway, Korea.—The Japanese military authorities have formally handed over at Chemulpo the Seoul-Fusan Railway to the director of the Korean Railways Bureau.

Restoration of the Tientsin Railway.—Negotiations for the restoration of the Tientsin Railway to China have been opened by the Chinese officials with the foreign ministers at Peking.

Federated Malay States Railway Shops.—The railway shops of the Government of the Federated Malay States, which were recently removed from Taiping to Ipoh, are to make another journey, and this time to Kuala Lumpur, the federal capital.

Canton-Whangpoa Railway.—The British minister at Peking has demanded of the Wai-wu-pu to instruct the Viceroy of Two Kuang Province to suspend the work of constructing the Canton-Whangpoa Railway. The cause of British inteference has not yet been made public.

Kowloon-Canton Railway.—A severe outbreak of malarial fever has occurred among the coolies engaged in cutting the hill near Shatin for the tunnelling in connection with the construction of the Kowloon-Canton Railway. Hongkong hospitals are reported to be receiving numbers of the laborers daily.

Canton-Amoy Railway.—Viceroy Shum is reported to have arranged all the right-of-way and will give military protection to all construction camps. The route is from the East Gate to Whampoa and direct to Amoy, a distance of 1,500 ms. The line and company have been registered. Construction may begin sooner than was originally intended.

Railways in China.—Great development is taking place in China in connection with railways, and the Chinese themselves are forming companies and raising capital for building the lines. So long as there is nothing in the shape of a concession or exclusive control, the Chinese are willing to cooperate with foreign contractors for the building of the various lines.

Palace Cars, Kinshin Railway, Japan.—The J. G. Brill Company, Philadelphia, Pa., recently received an order from Japan for five palace cars for the Kinshin Railway. These cars will be of steel underframes, vestibuled and finished and equipped throughout in the most elaborate manner. The firm also received orders from the same road for the steel underframes and trucks for 25 passenger coaches.

Federated Malay States Railways.—According to the annual report for 1905, by Sir William Taylor, Resident-General of the Federated Malay States, recently issued, the Government spent $6,880,000 on railways, against $6,240,000 in 1904. This included $1,349,505 paid to the Government of the Straits Settlements on the purchase of the Malacca Railway and $2,034,991 expended on railway construction within the federated states. Railways show an increase of 56 ms. constructed during the year, and now total 396 ms.

Railways in the Malay Peninsula.—The railways open for traffic in the Federated Malay States extend at present to 396 ms. The total length of the main trunk line from Jahore Bahru to Prai, now under construction in the Province of Wellesley, will be 472½ ms. when completed. At the present moment, exclusive of the construction in Jahore territory, there are 33 ms. odd under construction S. of Tampin, 21 ms. of which are ready for opening. Other lines are contemplated leading N. through Pahang, for which preliminary surveys have already been made, and routes have been explored through Kelantan to Kota Bahru, at the mouth of the Kelantan on the coast of the China Sea.

South Manchurian Railway.—The cost of necessary work on this scheme is estimated as follows:—Reconstruction or improvement of main line between Tairen and Changchun, and construction of rolling stock, -Y-28,000,000; improvement to Tairen Harbor, -Y-5,000,000; working capital for Fuchum and Yentai collieries, -Y-4,000,000, doubling of track between Tairen and Suchatun, -Y-9,600,000; cost of land and capital for warehouse business, -Y-8,000,000; capital for marine transport department, -Y-10,000,000; reconstruction of line between Mukden and Antung, -Y-22,000,000; reserve fund, -Y-13,400,000. Total sum to be raised, -Y-100,000,000.

Manchurian Railways.—The reconstruction of the railway between Changtu and Shwang-miao-tsz has been finished and formally opened to traffic. The sections N. of Shwang-miao-tsz will be opened to traffic by the end of October. The repairs to the Southern Manchurian Railway, between Shwang-miao-tz and Kunchuling—a section which was in the most ruined condition when received by the Japanese from Russia—have made so great a progress that they will probably be completed by the end of the current month. The repairing work is also in progress on the Kunchuling-Changchun section. It is believed that the whole line of railway will be ready for the running of trains by the middle of November, or a month earlier than was originally expected.

Mechanical Supplies for Chinese Railways.—The imperial railway management of China expends approximately $1,500,000 gold annually in the purchase of foreign mechanical supplies. In this connection, however, it may be stated that railway materials represent but a small value this year in the matter of the construction of the Canton-Hankow Railway in consequence of the difficulties which have arisen over the line. The value of machinery purchased was about the same as last year, or $95,000 gold. Under this heading considerable development may be looked for in future years. It must be noted that heavy machinery to the value of over $150,000 gold was imported at Canton from Hongkong.

Railway from India to China.—The importance of developing Indian trade connections with China grows yearly, says *Railways* (Calcutta). In an official note on the Burma transfrontier trade routes into Western China Mr. T. C. Wilson, Settlement Commissioner of Burma, writes:—The development of the Western China trade depends upon the mode of transport employed. Under existing circumstances there is an entire absence of trade for 4 mos. in the year, that is, from June to September. During the rains the roads are impassable for pack animals of any description. Last year the heavy rains flooded the country, washed away roads and bridges and caused a block in the opium trade. In the interests of commerce in general and of this province in particular it is very desirable that Bhamo and Tengyueh should be connected by a railway, so as to secure uninterrupted trade communication with Western China. A railway of any description would considerably enhance the importance of Bhamo, which is the emporium for British goods for China, as Tengyueh is for those from China. Another consideration of importance in favor of the construction of a line of railway is that goods could be booked direct from the Rangoon customs office to Tengyueh in bond without breaking bulk at Bhamo.

ELECTRIC LIGHTING, TRACTION, POWER, ETC.

Siam Electricity Company, Bangkok.—The tram cars of this company's lines run on an average 739,386 ms. a year.

Tokyo-Yokohama Electric Railway.—The construction of the second line of this road has been completed and it is now in operation.

Native City, Shanghai.—Negotiations are now in progress for the electric lighting of the Chinese City of Shanghai, and the contract for this is likely to go to a German concern.

Telegraph Line to Manchuria.—China is taking the necessary preliminary steps for the construction of a telegraph line to connect her principal cities with the important commercial centers of Manchuria.

Turbo-Generator in Bangkok.—The Siam Electricity Company, Ltd., has istalled a turbo-generator at its power station which makes 1,800 r. p. m. at a pressure of 150 lbs. per sq. in., and generates 500 kws. of current.

Electrically-Driven Paper Mill, Japan.—Messrs. Mitsui & Co. have arranged to establish a large paper mill on the banks of the Tetorigawa River, Kaga Province, from which water-power, electrically driven, will be generated.

Electric Fans, Japanese Railways.—Electric fans are now fitted in the 1st-class carriages on the Imperial Japanese Government Railways, and a trial of a ventilator intended for 2d-class carriages has been made with satisfactory results.

Electrical Power Plant, Shanghai.—The contract for the supply of the new machinery and plant, required by the municipal electrical department of Shanghai to enable it to provide power for the tramway service, has been placed with Messrs. Bruce, Peebles & Co.

Japan-America Cable Service.—Since the opening of the direct cable service between Japan and America on August 1st, from 100 to 280 messages have been despatched over the line every day, and the income to the Japanese Government amounts to -Y-16,000 a month, or about -Y-200,000 a year. Before the service was opened the Government paid from -Y-100,000 to -Y-200,000 each month to the Great Northern Telegraph Company.

PUBLIC AND PORT WORKS, DOCKS, ETC.

Floating Dock, Japan.—The Kawasaki Dockyard Company, Kobé, has decided to build a floating dock of 15,000 tons, at a cost of -Y-250,000.

Waterworks, Newchwang.—The concession for the supply of water to this city has been secured by an Englishman, and British capitalists will be offered the investment.

Canton Waterworks.—More than 2,000 coolies are now employed on the construction of the new waterworks plant at Canton and four reservoirs have been dug out near a place called Tsangpoa.

Government Waterworks Aids, Japan.—The Government aids to cities in Japan for the construction of waterworks in Moji, Niigala, Hiroshima, Osaka, Otaru and Nagoya, for the next fiscal year, will total about -Y-800,000.

Waterworks at Dalny.—The Japanese authorities are contemplating the enlargement of the waterworks at Dalny. Originally built by the Russians, the works were damaged during the war and repaired since the occupation by Japan.

Chemulpo (Korea) Waterworks.—A plan is on the way to construct waterworks at Chemulpo. The water will be derived from Hangang, and reservoirs constructed on the banks of the Yöngsan. Land for this purpose has been acquired.

Harbor Investigating Committee, Japan.—With a view to perfecting the harbor accommodation and opening new harbors to cope with the requirements of the development of the country, the Japanese Government has appointed a harbor investigating committee.

Megane Bridge, Tokyo.—This structure, one of the landmarks of Tokyo, is to be destroyed in order to make way for the station of the Kobu Railway. The company has undertaken to enlarge the Shohei Bridge, to compensate for the removal of the Megane. The work is now under way.

Another Dock, Shanghai.—The Shanghai Engineering Company will soon begin the construction of a new dock on the Shanghai side of the Whangpoa, on the site of its present work, as soon as the assent of the harbor and conservancy authorities is obtained. The dock will take in ships up to 320′ with a draught of 20′. The company has a reserve fund equal to its capital of Tls. 120,000.

Construction of Roads, North China.—It has been decided by the Chinese authorities to begin the construction of public roads outside of the foreign settlement of Shanghai, immediately. Surveyors have begun to work out the proposed roads, which are to be of a uniform width of 50′ (Chinese measure), including sidewalks, the latter of which are to be 8′ (Chinese measure), on either side of the road, thus making the road proper 34′ in actual width. Householders are warned that dwellings standing in the way of the proposed roads have to be taken down and removed.

Breakwaters and Wharves, Yokohama.—Baron Mitsui Hachiroemon has asked permission of the Japanese Government to reclaim 95,085 *tsubo* of land at Yokohama from the sea. The cost of the undertaking is set down at -Y-4,541,205. It is intended, if permission is granted, to construct breakwaters and wharves. The area that is to be reclaimed extends from the E. breakwater of the custom house and the right bank of the Shin Ikutagawa. Starting at the E. end, a breakwater, 195 *ken* in length, will be built. The outer or E. side will be used as a regular breakwater, while a wharf, 180 *ken* in length, will be constructed along the inner side. This will be called breakwater No. 1. Starting at a point about 75 *ken* W. of this breakwater, breakwater No. 2 will be constructed parallel to No. 1. The second wharf will afford accommodation to vessels on both sides and will be 100 *ken* IN LENGTH.

Kawasaki Dockyard Activity.—The Kawasaki Dockyard Company, Ltd., is at present working its plant at high pressure, according to the *Kobé Herald*, the following list of vessels being under construction:—Osaka Shosen Kaisha, two steamers of 2,500 tons each to complete next spring; Hunan Steamship Company, one steamer of 1,500 tons, to complete this (October) month; Nippon Yusen Kaisha, three steamers of 3,500 tons each, to complete next winter and spring, and two steamers of 8,700 tons each, to complete in 1908; Viceroy of Hukuang, six gunboats of 740 tons each, to complete next winter and spring, and four torpedo boats, to complete in the same time; Japanese Naval Department, one despatch boat of 1,251 tons, to complete in 1907, and one destroyer of 350 tons, to complete next spring; Viceroy of Liangkiang, three gunboats of 600 tons each, to complete in 1907; Siamese Naval Department, one destroyer of 380 tons, and three torpedo boats, to complete in 1907.

Public Works, Singapore.—The Singapore Municipality is raising a loan of $1,600,000 at 4½ per cent for the following public works:—Raising dam, $10,485.84; Stamford Canal, $66,826.42; Completion of filters 11-12, $9,962.81; purchase of Worthington pumps, $82,724.93; new water mains, $100,000; electric power installation, $200,000; new cinerators, $35,000; Pearl's Hill reservoir, $55,000; Mahomedan Cemetery, $60,000; Tanjong Katong-rds, $75,000; Cantonment-rd, 25,000; salt-water system for street sprinkling, $150,000; Bididari Cemetery laying out, $50,000; bridge over Singapore River, $140,400; quarantine camp, $100,000; Kalang Tunnel, $140,000; new markets and extensions, $130,000; fire stations, $70,000; purchase of land for street improvements, $50,000; reforming town drains, $50,000. In response to a question recently propounded in the Legislative Council at Singapore as to the list of public works the Government was to undertake in the Straits Settlements, the Colonial Secretary replied:—The works it is proposed to carry out: are (a) Singapore River improvement, $4,650,000; (b) extension of Penang Pier, $1,260,000; (c) Lagoon Dock, $7,000,000; (d) reconstruction of wharves, $6,900,000; (e) graving dock, $3,300,000

Singapore Harbor Improvements.—At the recent annual meeting of the Singapore branch of the Straits Settlements Association, the committee reported on the expropriation of Tanjong Pagar and the question of the harbor scheme. With regard to the latter the committee decided not to oppose the construction of the inner moles, provided the Singapore River was at the same time proceeded with and as long as the proposal to construct the outer moles was not revived. Later on, however, after the Tanjong Pagar arbitration award was published, a majority of the committee came to the conclusion that in view of the altered financial outlook caused by the Tanjong Pagar award it was necessary in the best interests of the colony that the work of constructing the inner harbor to the roadstead, as designed by Messrs. Coode Son & Matthews, be postponed, and that the money contemplated to be expended thereon be diverted towards providing the money required for the improvement and development of Tanjong Pagar. A copy of a resolution embodying the salient features of the report was forwarded to the Government of the Straits Settlements and to the colonial office in London.

SHIPBUILDING, MARINE, ETC.

Destroyer "Yamahiko," Japan.—This warship (ex-*Riesitelni*) has undergone repairs at Nagaura, Japan, and is now at Yokohama.

Equipment of Destroyers, Japan.—The equipment of the destroyers *Shirotaye* and *Nowake* is expected to be finished in December.

Osaka Shosen Kaisha.—This company has determined to make Yokohama the terminus of its present Kobé-Hankow line instead of Kobé.

Naval Vessels, Japan.—The Navy Department of the Japanese Government contemplates the sale of various vessels which have become obsolete and worn out.

Straits Steamship Company.—The Straits Steamship Company's new steamer *Perak* has inaugurated a new service from Penang to Port Swettenham and Singapore.

Mining Vessel for Siam.—Messrs. Howarth Erskine, Ltd., of Singapore, have delivered to the Siamese navy a twin-screw composite mining vessel. Her length is 62′ 6″ over all, breadth 4′, and depth 6′.

Drydock "Dewey."—The United States army transport *Kilpatrick* received a thorough cleaning and out-board overhauling in the floating dock *Dewey* at Olongapo, before she sailed for New York the fore part of the present month.

Measurement of Winds at Sea.—Mr. Shinrin Baba, a Japanese, has invented an instrument which is said to record with a great accuracy the strength of the wind at sea. It has been tried on board the *Taisei-maru* and found most successful.

Kerosene as Maritime Fuel.—The Toyo Kisen Kaisha has decided to use kerosene instead of coal on two of its steamers now under construction in Japan. The company is also contemplating the use of oil on the *Nippon-maru* and its other Pacific liners.

Turbine Monopoly in the Orient.—It is announced that the Mitsu Bishi Dockyard and Engine Works, Nagasaki, have purchased the monopoly of the turbine machinery in the Orient. The engines of the turbine system will be used on board the new Japanese despatch boat *Mogami* and the proposed volunteer vessels.

New Vessels for Hankaku Railway Company Japan.—This company has decided to purchase several steamers to cope with the great increase in traffic, both passenger and freight, which has resulted since the opening of the line to Maizuru. The vessels are to have a displacement of 800 tons each, and to meet this outlay the company has issued debentures to the amount of -Y-200,000.

Japan-Vladivostock Service.—Negotiations are being carried on by Japanese shipowners with the Eastern Asiatic Steamship Company, Vladivostock, with a view to a fare and freight arrangement between Vladivostock and Japanese ports. The steamship company proposes to maintain its service between Tsuruga and Vladivostock even in winter, and is constructing another ice-breaker for that purpose.

Refloating Sunken Vessels, Port Arthur.—The work of refloating sunken vessels has been nearly completed by the Japanese at Port Arthur, although the 21 steamers which were sunk to blockade the entrance of the harbor have not so far been brought completely to the surface with the exception of the *Yahiko-maru*. They are not being raised in parts, and it is not expected that the work will be completed before February next. Steamers are forbidden to enter the harbor by nights.

Toyo Kisen Kaisha.—This company has ordered the construction of a vessel of over 10,000 tons for its American service, and three vessels of 8,000 tons each. As the Mitsu Bishi Dockyard and Engine Works, Nagasaki, were unable to accept the commission, on account of other work, the Kawasaki Dockyard Company, Ltd., Kobé, has been asked to undertake the work, and it is believed that the contemplated immediate extension of the dockyard will enable the Kawasaki concern to accept the order, independent of the fact that it also has a large number of vessels now in hand.

Nippon Yusen Kaisha.—This company has lowered the 1st-class fare between Yokohama and London, as follows:—Ordinary ticket to be issued at Yokohama, -Y-500; return ticket, -Y-500 and £44. Ordinary ticket to be issued at London, £55; return ticket, £55 and -Y-400. The company, moreover, has inaugurated a world-round service. Steamers from Hongkong, Shanghai and Japanese ports will sail direct for Seattle, whence passengers will be conveyed to New York or Montreal by the Great Northern or the Northern Pacific railroads, to be taken to London by Atlantic liners. The return voyage will be *via* the Suez route.

New Nippon Yusen Kaisha Steamers.—Details of the increase in the fleet of this shipping company by twelve steamers are gradually being made public. Three of the new vessels are for the Japan-Shanghai line, and are being built by Messrs. Henderson & Co., England. Of these the *Awaji-maru* has been launched. The other two, *Chikuzen-maru* and *Chikugo-maru*, will be launched this month and in November respectively. Three other steamers for the Yangtsze River service (3,000 tons each), which are now under construction at the Kawasaki yards, will be launched in December, this year, and January and March, next year, respectively. The substitute for the *Hitachi-maru* (6,550 tons) will be launched from the Mitsu Bishi Engine Works, Nagasaki, towards the end of November. The company has recently placed orders for two European liners with the Kawasaki Dockyard Company, Ltd., and four with the Mitsu Bishi Engine Works, each steamer to have a displacement of 7,000 tons. They will be completed in 1908.

Shipping at Saigon.—The British vice-consul at Saigon, Mr. J. L. O'Connell, in the course of his annual report on the trade of Cochin-China, gives the following table of the tonnage cleared from Saigon during the years 1886-1904, a comparison between the four principal nations engaged in the trade:—

	French.	*British.*	*German.*	*Dutch.*
1886	228,871	231,475	94,638	51,326
1887	243,649	222,915	77,985	40,727
1888	237,367	194,438	141,349	32,274
1889	217,581	130,636	100,020	....
1890	214,866	173,169	147,317	....
1891	218,738	153,135	124,088	13,028
1892	222,235	190,987	157,365	7,690
1893	207,050	202,444	206,419	20,795
1894	228,202	178,550	153,921	30,400
1895	239,256	177,730	168,021	7,338
1896	245,399	155,366	160,194	1,415
1897	238,652	185,768	174,910	....
1898	288,895	199,078	144,665	4,367
1899	319,274	199,327	129,239	5,161
1900	347,735	169,977	177,190	6,745
1901	345,012	174,733	188,078	7,237
1902	473,264	204,931	231,169	4,712
1903	476,298	89,379	135,078	4,775
1904	519,993	424,919	212,827	3,477

The miscellaneous tonnage during this period rose from 24,000 to 161,000 tons, and the total tonnage from 630,865 to 1,322,776 tons.

MINES AND MINING

Mining School, Korea.—The Korean authorities have decided to establish a mining school at Seoul. The instructors will be Japanese.

Mining Charters, Korea.—Applications thus far received by the Korean Government for charters for working mines number nearly 175. Over 160 of these are from Japanese.

Heilungchiang (China) Gold Fields.—It is semi-officially stated that the Russian Government has instructed its minister at Pekin to restore the Heilungchiang gold fields to China.

Mining Rights, Federated Malay States.—According to the *Times of Malaya*, the option given to Messrs. Behn Meyer & Co., of Manila, Singapore and Penang, of acquiring the Sungei Besi mining rights, is said to be for the amount of £1,000,000.

Cowie Harbor Coal Company, B. N. B.—This company is reported to be making good progress. It has already shipped more than 400 tons of coal, principally by local coastwise steamers. The output is expected to fully realize expectations, according to Mr. R. W. Clarke, the manager.

Abuta Iron Mine, Japan.—The prospects of the new Abuta iron mine at Iburi, Hokkaido, which began operations last year, are good. The mine contains iron-ore at the rate of 56% and the ore is refractory. The Wakamatsu iron factory has contracted for a supply of some 80,000 tons from this mine.

Value of Fushun Mines.—A mining expert, who has just completed a report on the Fushun coal mines, estimates that the supply is almost inexhaustible, and that the quality of the coal far surpasses that of many of the best mines in Japan. He values the mines, which are located in Manchuria, at -Y-500,000,000.

Mineral Deposits in China.—The flotation of companies to work mineral deposits in China seem to have commenced in real earnest, but in the present attitude of the Peking Government there appears to be no security for foreign capital. Even when the concessions are absolutely secured, the composition of the boards of directors is not such as will command the confidence of foreigners.

New Japanese Gold Mines.—The Hakko Kizan Kwaisha is the name of a gold-mining company which has lately been organized in Tokyo with a capital of -Y-500,000 to work extensive gold mines in Hakko-zan, a mountain range extending to Higashishirakawa-gori, Fukushima-ken, Nasu-gori, Tochigiken, and Kuji-gori, Ibaraki-ken. In the experimental boring 20 to 30 mommée of gold have been daily obtained.

Kiangpei Concessions Ltd., Shanghai.—The name of this concern has been changed to the Kiangpei Ting, Coal and Iron Mining Company, Ltd., because the Chinese officials of Szechuan Province objected to the worn Concession. It is a British-Chinese concern organized for the purpose of developing the Longwangtong mines. Mr. Archibald Little is now preparing to construct a light railway from the mines to the Kialing River, a distance of 40 *li*, to facilitate the export of the excellent Kiangpei coal.

Dutch Borneo Oil Output.—Statistics of the Dutch Borneo oil output show that 92,330 tons of crude oil were produced the second quarter, and 207,620 tons in the first half of the present year, as compared with 191,090 tons in the corresponding period of 1905. The shipments of kerosene in the first quarter were 38,502 tons, and of other products 34,140 tons, and in the first half of the year 61,835 tons of kerosene and 61,783 tons of other products, as against 60,420 and 67,263 tons in the corresponding half of 1905.

Mining Operations in Japan.—Mr. Furukawa, who owns most of the gold, silver, copper and iron mines in Yamagataken, has made elaborate arrangements in order to increase the output of the various workings under his control. Two Tokyo capitalists are also actively engaged in opening up copper and zinc mines in this district, while others are also making preparations to work the gold mine in the neighborhood of Hijiori-mura Hot Springs, in Mogamigori. This mine is generally believed to be a rich one.

New Korean Mining Law.—Ambassador Luke E. Wright, in forwarding to Washington from Tokyo an official translation of the mining law of Korea, which was promulgated July 12th, calls attention to the following articles which apply especially to the interests of foreigners in that country:—

Art. 27.—Inasmuch as the measures to be taken under the present law and the detailed regulations for carrying out the same will in many cases concern foreigners, no such measures shall be decided upon or executed without the previous consent of the resident-general. This stipulation shall also apply with regard to the mines belonging to the imperial household department.

Art. 30. Foreigners who have been granted mining rights and have begun operations in connection therewith before the promulgation of the present law and are still carrying on such operations, shall observe the provisions hereof so far as they do not conflict with the terms of the grants made to them.

Siberian Mining Concessions.—The Russian Government offers to all companies or persons desirous of sending prospectors to Cape Chukotski, Eastern Siberia, for mining purposes, to obtain for them the lease of one or more claims, same to be chosen and located by them and to remain in the possession of the lessee, his heirs and legal representatives, successors and assigns, until the mine is exhausted—if they comply with all the conditions of the contract signed with the company. Whereas:—(1) According to the Russian mining laws, mining on the Chukotski Peninsula and in the whole of the Primorsk Province is prohibited to foreigners; (2) Under the contract signed with the Russian Government, the Northeastern Siberia Company, while having the sole right, until 1910, to prospect for minerals and work mines on the Chukotski Peninsula E. of the rivers Angeioma and Ennenkal, can transmit that right to other persons only by special permission and in its entirety, without parceling the concession into separate claims; and (3) It will be possible for the company, under the general mining laws and under the stipulations of the abovementioned contract with the Russian Government, to transfer such claims only after the above-mentioned term of exclusive rights in the whole of the peninsula shall have expired and after the allotment to the company of such separate localities which the said company may wish to retain; *Therefore*, the Department of Commerce and Industry warns all persons who have already entered or are desirous of entering into agreements with the Northeastern Siberia Company, with a view to leasing claims on the Chukotski Peninsula, that the Imperial Russian Government will not admit or recognize the rights of such persons to these claims, although the same be based on agreements or contracts concluded with the above named company.

FINANCIAL AND MISCELLANEOUS

Toyo Kisen Kaisha.—The net earnings of this company for the first half of the current year were -Y-70,165.

Nippon Industry Encouragement Bank.—This concern has decided to issue further debentures of -Y-1,000,000.

Korean Cotton Company.—Capitalists of Osaka are organizing a Korean cotton company with a capital of -Y-200,000.

Paknam (Siam) Railway Company.—The profits of this company for the first half of the current year were Tcs. 53,659.32.

Tokyo Clearing House.—The deposits in the associated banks of the Tokyo Clearing House are reported to have reached an aggregate of -Y-200,000,000.

Flour-Milling Enterprise.—Japanese capitalists are arranging to establish flour mills at Tokyo and Hankow, China. The company has a capital of -Y-2,000,000.

Shanghai and Hongkew Wharf Company, Ltd.—This company has decided to issue 4,000 new shares on terms communicated to the shareholders by circular.

Miyakejima Products Company, Japan.—This company has increased its capital from -Y-30,000 to -Y-300,000, and will establish factories at Oji and in Hokkaido.

Yokohama Sugar Refining Company.—This company has been organized with Messrs. K. Abe, M. Masuda, K. Masuda, Z. Tanaka and Konosuke Abe as directors.

Engineers to be Selected.—The Premier of New South Wales has authority to select ten engineers, with salaries ranging up to $5,000 gold each, for a large engineering work.

Eastern Asia Flour Mill Company.—This is a Japanese company with an authorized capital of -Y-3,000,000. It aims at conducting its business both in Japan and China.

Iwashiro Sulphur Company.—Iwashiro Province (Japan) capitalists, headed by Messrs. Motoyama & Okabe, have organized this company. It has a capital stock of -Y-500,000.

Yokohama Specie Bank.—The net profits of this institution for the first half of the current year were -Y-3,363,908.04. The interim dividend was at the rate of 10 per cent *per annum.*

Japanese South American Consulates.—The Japanese Government has determined to establish consulates in South America, to develop commerce and emigration to that country.

South Manchurian Railway Receipts.—The daily receipts of the South Manchurian Railway at present average about -Y-13,000. Over 7 900 persons are now employed regularly on the line.

Tobacco Monopoly, Japan.—The tobacco crop of Japan this year is estimated at 15,000,000 *kwanme* (*kwa.*, about 3¾ kilos), being an increase of more than 20 per cent over an average year.

Another Insurance Company, Japan.—Messrs. A. Fukuhara, K. Makoshi, S. Hiranuma and other Japanese capitalists, are organizing a fire insurance company at Tokyo with a capital stock of -Y-5,000,000.

Hotel Scheme, Tokyo.—The aldermen's council of Tokyo has been asked by Mr. Nakano, president of the Tokyo Chamber of Commerce, for a loan of -Y-300,000 for the purpose of building a hotel.

Tokyo Stock Exchange.—*The Japan Times* says that the delivery of shares on the Tokyo Stock Exchange at the end of August broke the record in amount. It numbered 130,850 shares, valued at -Y-10,443,490.

Austrian Bridge, Tientsin.—The remaining parts of the new Austrian bridge under construction at Tientsin have arrived there and it is believed the structure will be opened to traffic before the end of the current year.

Yokohama Waterworks Loan.—Messrs. Samuel Samuel & Co. have made overtures to the Yokohama municipality to the taking up of the waterworks loan, amounting to -Y-3,000,000, which is to be issued by the city.

Chartered Bank Dividend.—The directors of the Chartered Bank of India, Australia and China have declared an interim dividend at the rate of 13 per cent *per annum*, free from income tax, for the half year ended June 0th last.

Chambers of Commerce, China.—Most of the larger towns in the Province of Chekiang are establishing chambers of commerce. These are semiofficial bodies, being under the supervision of the local bureau of agriculture, trade, industry, and mines.

Tokyo Spinning Company.—This company is about to increase its capital of -Y-1,200,000 to -Y-4,800,000. The object is to extend the plant to 500 looms and 60,000 spindles, which will involve an immediate addition of 125 looms and 30,000 spindles.

Industrial School, Seoul.—The Japanese and Korean authorities have decided to establish an industrial school at Seoul. The initial expenses are estimated at -Y-200,000, and the annual expenses at -Y-40,000. Among the sciences taught will be civil engineering.

Water Power Electric Company, Yingkow, China.—This company, which has been formed by Japanese with a view to developing various industries in China, with electricity for power, has a capital of -Y-2,000,000. The head office of the company is in Tokyo.

Tokyo Electric Power Company.—The organizing general meeting of this corporation was held recently, and the following officers elected:—President, Mr. Tokunori Asada; directors, Baron Shibusawa and Messrs. K. Ohura, S. Asano, M. Tachikawa, T. Nakane, and T. Okochi.

Cotton Milling in Shanghai. The cotton mill business in Shanghai is making good progress. At present the spindles number about 300,000, of which 100,000 are owned by the Chinese, 100,000 by the British, 50,000 by the Japanese, and 40,000 by the Germans. The trade in general is most active at present.

Tsukijima Rope Manufacturing Company, Japan.—This company intends to extend its business by issuing new shares and also to establish a wire-rope factory. The directors are reported to be negotiating with representatives of the Tokyo and Susaki rope manufacturing companies with a view to the amalgamation of their interests.

Glass Factory, Osaka.—A scheme is on foot to establish a large glass factory at Osaka, under joint ownership of Japanese and Belgians. The capital will be -Y-1,500,000, of which sum -Y-1,000,000 will be subscribed by the Belgians and French, and the balance by Japanese. The patent Belgian window plate glass will be manufactured.

Cement Manufactory, Canton.—It is announced that Chinese capitalists of Canton have acquired a site for the erection of a large Portland cement factory. A kind of limestone, said to be suitable for cement manufacture, has been found on a hill in Fa Yuen District, where a branch factory will be put up to supply the main works.

Shanghai Oil Company, Ltd.—This company has secured a little more than 12 *mow* of land at Jessfield. The contract for its building has been let, the foundations completed, and the walls are already under construction. The buildings are expected to be finished by the time the machinery arrived, the installation of which will be pushed as rapidly as possible.

Industrial Bank of Japan in Korea. According to *The Japan Times*, the Japanese authorities have decided to appoint the Industrial Bank of Japan agent for promoting the industry and agriculture of Korea. The bank will make loans not only to various Government works, but also on hehalf of individual and agricultural property in the Hermit Kingdom.

Tokyo Kisen Kaisha.—At the recent general meeting of this company a resolution was passed to the effect that the company shall issue during the next year debentures amounting to -Y-3,900,000 in order to pay for a portion of the cost of five cargo boats, valued at -Y-6,000,000. The balance will be made good by the issuance of another batch of debentures at a suitable time.

Singapore Branch, Straits Settlements Association.—At the recent annual meeting of this association, the following officers and committee were elected for the ensuing year:—President, Hon. John Anderson; vice president, Mr. W. G. St. Clair; honorary secretary and treasurer, Mr. Rowland Allen; committee, Messrs. Maclaren, Peirce, Gentle, Eidin, Tan Jiak Kim. Fort, Ellis, and Robinson.

North Borneo Trading Company.—At the ninth ordinary meeting of the directors of this company, held recently in London, it was reported that the trade accounts for the year showed a gross profit of £3,297, and the profit and loss account, after charging all expenses, showed a credit balance of £1,431, which, with the balance for the preceding year, £2,723, made a credit total of £4,154. The company cultivates rubber.

Chinese Imperial Bonds.—The London office of the Hongkong and Shanghai Banking Corporation gives notice that 5,000 bonds, representing £500,000 of the Chinese Imperial Government 5 per cent gold loan of 1905, will be paid off at par on March 1st next. The numbers of bonds to be redeemed will be drawn in January, 1907, and will be in addition to the ordinary annual drawing of 500 bonds, representing £50,000.

Cement Market, Japan.—Reports from Japan are to the effect that the cement market of that country is now very active, owing to the resumption of different works already in course of construction, which were suspended during the war. In the early months of last year prices on cement ruled at -Y-3.20 or thereabouts, per bbl; but they have now advanced to -Y-4.70. It is said that orders are being received in considerable quantity from America, Manchuria and Korea.

Hokkaido Colliery and Railway Company, Japan.—In connection with the loan of £1,000,000 which this company raised in London some time ago, as a result of the nationalization of the railway, the Japanese Government will bear 40 per cent of the loan and the company the remainder, 60 per cent. The directors of the concern have proposed to the shareholders that the name, in view of the nationalization of the road, should be changed to the Hokkaido Colliery Steamship Company.

Reclamation of Agricultural Lands.—Japanese and Korean capitalists have organized at Seoul a reclamation and cultivation company, with a capital of -Y-1,000,000, for reclaiming waste land and improving the cultivation of land already reclaimed but not productive. The company will at once come into limited possession of 34,527 acres in the N. and S. of Kyongsang-do. The land has been actually surveyed and permission to reclaim it has been obtained from the Government.

Johore Planters' Association.—This association was recently organized at Johore, with the following officers:—Honorary president, H. H. the Sultan of Johore; vice-presidents, H. E. Sir John Anderson, K. C. M. G., governor of the Straits Settlements; Sir Frank Swettenham, K. C. M. G., and Hon. John Turner, M. L. C., Penang; chairman, Mr. F. Pears, Lanadron Estate, Muar; honorable secretary, Mr. Staples, Johore Bahru; committee, Mr. E. Valpy, Gunong Pulai, Johore, and Mr. Stanley Arden, Pulau Kukob, Johore.

Cement Contract, Manila.—Messrs. Findlay & Co., of Manila, have been awarded the contract for supplying 30,000 bbls. of their "Alsen" brand of cement to the military establishment of the Philippine Islands to be used for fortifications at Corregidor and Isla Grande, the latter place being in Subig Bay. Other bidders were W. H. Anderson & Co. and E. C. McCullough & Co., Inc., "Green Island" brand; Froelich & Kuttner, "Saturn" brand; H. W. Peabody & Co., "Atlas" brand; Behn Meyer & Co., "Hemor" brand.

Siam Electricity Company, Bangkok.—In 6 mos. this company earned about Tcs. 300,000. There was some difficulty in making the tramway pay because, owing to competition, the Samsen line showed a deficit of Tcs. 40,000. On the other hand the Bangkolem line did better than ever before, and thus permitted the company to balance accounts. The total tramway receipts were Tcs. 787,130. During the past year the company has spent over Tcs. 500,000 in improvements to its plant, etc., and during the past 3 yrs. Tcs. 100,000 were paid out in dividends.

Korean Waterworks Company, Ltd.—The first ordinary general, or statutory, meeting of this company was held recently in London, Baron George de Reuter presiding. The company has a share capital of £250,000, and the whole of the debentures, *viz.*, 2,500 of £100 each, have been subscribed for. The chairman reported that the work of constructing the waterworks plant at Seoul is well under way. The company's resident engineer is Mr. H. G. Foster Barham, who is now believed to be on the ground. Messrs. Livesey, Son & Henderson, London, are the company's consulting engineers, and the work will be done under their supervision.

Yokohama Engine Works, Ltd.—The report of the directors of this company for the year ended May 31st last, was recently presented to the shareholders at their eighteenth general meeting. The net profits for the 10 mos. under review amounted to -Y-38,320.80, or an increase of -Y-27,453 80 as compared with the previous 12 mos. This former sum to which was added -Y-13,614.55 brought forward from previous account, left the directors -Y-51,935.35 available for distribution, which it was decided to appropriate as follows:—Dividend at the rate of -Y-10 per share, -Y-26,000; establishment of a reserve fund -Y-20,000; carried forward to next account, -Y-5,935 35.

Paknam Railway Company, Ltd.—At the 30th ordinary meeting of the shareholders of this company, held recently, the following gentlemen were in attendance:—Chairman H. Dehlholm, Luang Sunthorn Kosa, Dr. T. Hayward Hays, Messrs. J. M. Dunlop, J. Robertson, J. McEwen, H. V. Bailey, and Secretary H. A. Tozer. The gross receipts for the 6 mos. were Tcs. 83,237.28 and the expenditures Tcs.29,577.96, leaving a profit of Tcs. 53,659.32. Traffic receipts for the period were the highest on record. In addition to his duties as chairman of the board of directors Mr. Dehlholm has been given the general management of the road.

Zamboanga (P. I.) Customs Receipts.—Zamboanga, the capital of the Moro Province, heads the list of Philippine ports in the matter of increased customs collections. The remarkable improvement in business conditions at this port is best evidenced by the following table which appears in a special report of the insular collector of customs covering the fiscal year, ended June 30th, 1906, which follows:—

1904	₱ 82,240.40
1905	108,719.86
1906	178,818.96
Total	₱369,779.32

German Money Issue in China.—The concession of the German-Asiatic Bank for issuing and circulating bank notes in the German Protectorate of Kiauchou and the German settlements in China, runs for 15 yrs. The bank notes will be of the value of 1, 5, 10, 25, and 50 dollars, and 1, 5, 10, and 20 *taels*. In the Chinese Province of Shantung only notes of the money standard of Tsingtau can be circulated. The dollar, as mentioned in this concession, is the current Mexican dollar or a coin which in general commerce is recognized as equal in value at the various places of issue or is made so by law. The bank agrees to pay 1 per cent *per annum* on the yearly average amount of the daily circulation of the bank notes. The sureties for the security of the notes are the Bank of Commerce and Industry, of Berlin; the Commercial Association, of Berlin; S. Bleichroeder; the German Bank; the Disconto Association, and Mendelssohn & Co., of Berlin.

Hongkong Industries, 1907.—Speaking on the budget of Hongkong Colony for 1907, Governor Nathan recently referred to the industries of the colony, with special reference to the new territories, in the following terms:—"The question of public works leads one naturally to the question of the progress of industries in this Colony. The year promises to be a very important one in this respect. The mining in the New Territory is now apparently advancing beyond the prospecting stage, and if it proves to be the success that its promoters anticipate the colony will benefit thereby. Another great industry which has been started this year is flour-milling at Junk Bay, to which we wish every success. Speaking last year on the subject of industries I referred to the assistance which was given to the promotion of industries by exhibitions. Since then we have completed an exhibition of the products of Hongkong and South China in the imperial institute in London. An exhibition of industrial arts in the colony has been arranged for, and we have also started again the annual flower show."

Government Iron Foundry, Japan.—This industry now supplies almost all the necessary material used in the construction of battleships; yet it still needs capital and work to make the foundry a profitable business. There are employed here 6,000 skilled artisans, and 1,000 temporal hands. The foundry mostly manufactures iron and steel plates, cartridges, building material and rails. The battleship *Aki*, and the cruiser *Ibuki*, now in course of construction, are receiving materials from this foundry. Generally speaking, the foundry, with the present ratio of manufacturing power, sends out of ordinary articles about 90,000 tons yearly, but for such refined articles as are used in building battleships, it can only supply 70,000 tons at present. But when the plan which the Government has projected for the foundry will be completed, it can produce 180,000 tons a year quite easily. In order to regulate the yearly quantity of coal production from the coal-mine in the possession of the foundry, a digging of a pit of 1,000 *shaku* has been devised as the successive work of 5 yrs. It has also begun in setting up another furnace besides the two previous ones. It will be completed next year. Finally the extension of the railway lines which are used for the conveyance of the manufactured articles from the foundry is among the new projects.

HEAD OFFICE:
BRUSSELS,
BELGIUM

BANQUE
SINO-BELGE
(SINO-BELGIAN BANK)

BRANCHES:
SHANGHAI,
TIENTSIN

Capital Fully Paid Up: Frs. 15,000,000 (£600,000)

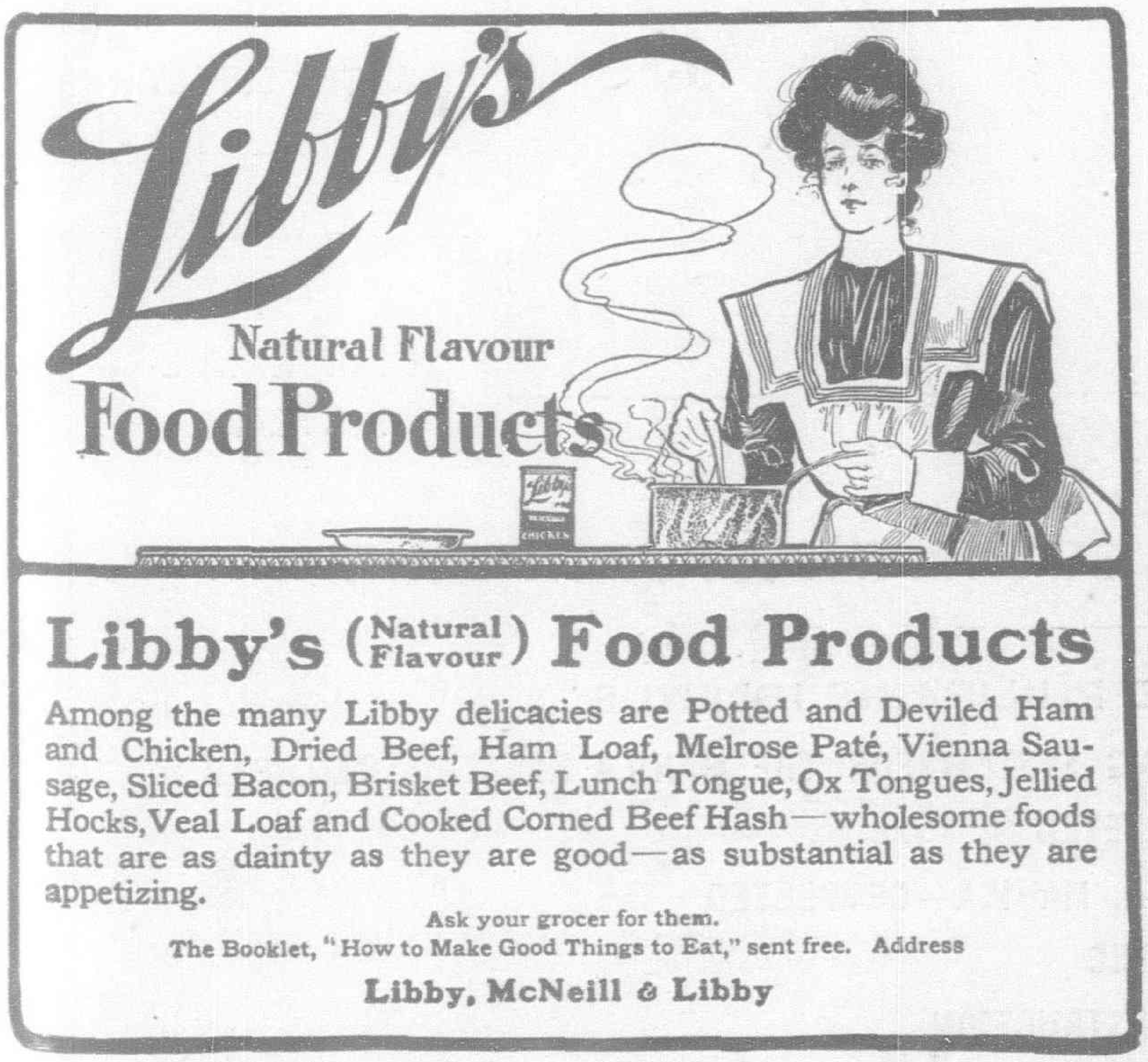
Chairman: BARON F. BAEYENS, Governor of the Société Générale de Belgique

AGENTS AND CORRESPONDENTS IN ALL PRINCIPAL CITIES

Every Description of Banking and Exchange Business Transacted

DEPOSITS RECEIVED AT SPECIAL RATES

Special Exchange Facilities with Belgium and France



Libby's
Natural Flavour
Food Products

Libby's (Natural Flavour) Food Products

Among the many Libby delicacies are Potted and Deviled Ham and Chicken, Dried Beef, Ham Loaf, Melrose Paté, Vienna Sausage, Sliced Bacon, Brisket Beef, Lunch Tongue, Ox Tongues, Jellied Hocks, Veal Loaf and Cooked Corned Beef Hash—wholesome foods that are as dainty as they are good—as substantial as they are appetizing.

Ask your grocer for them.
The Booklet, "How to Make Good Things to Eat," sent free. Address
Libby, McNeill & Libby

ORIENTAL HEADQUARTERS

LIBBY, McNEILL & LIBBY . . . No. 32 Nanking Road, Shanghai
WM. H. ANDERSON & CO., . . Foot Santa Cruz Bridge, Manila.

"U.S.Gov't Inspected"

"Sealtite wrapped"

Fresh from America

Swift's Premium
Hams and Bacon

No smoked meats equal Swift's Premium brands. Finest in quality because carefully selected from young corn-fed porkers, mild cured, smoked over slow burning hickory fires and then "Sealtite" wrapped so that both the Hams and Bacon reach you fresh, juicy and full flavored.

Swift & Company, U. S. A.

ORIENTAL HEADQUARTERS

SWIFT & COMPANY . . . . No. 32 Nanking Road, Shanghai
WM. H. ANDERSON & CO., . . Foot Santa Cruz Bridge, Manila.

J. G. WHITE & CO.
(INCORPORATED)
NEW YORK
Cable Address: "WHITEMOTH"

CODES:
Western Union
and A B C, 5th
Edition

J. G. WHITE & CO.
(LIMITED)
LONDON
Cable Address: "WHITTERICK"

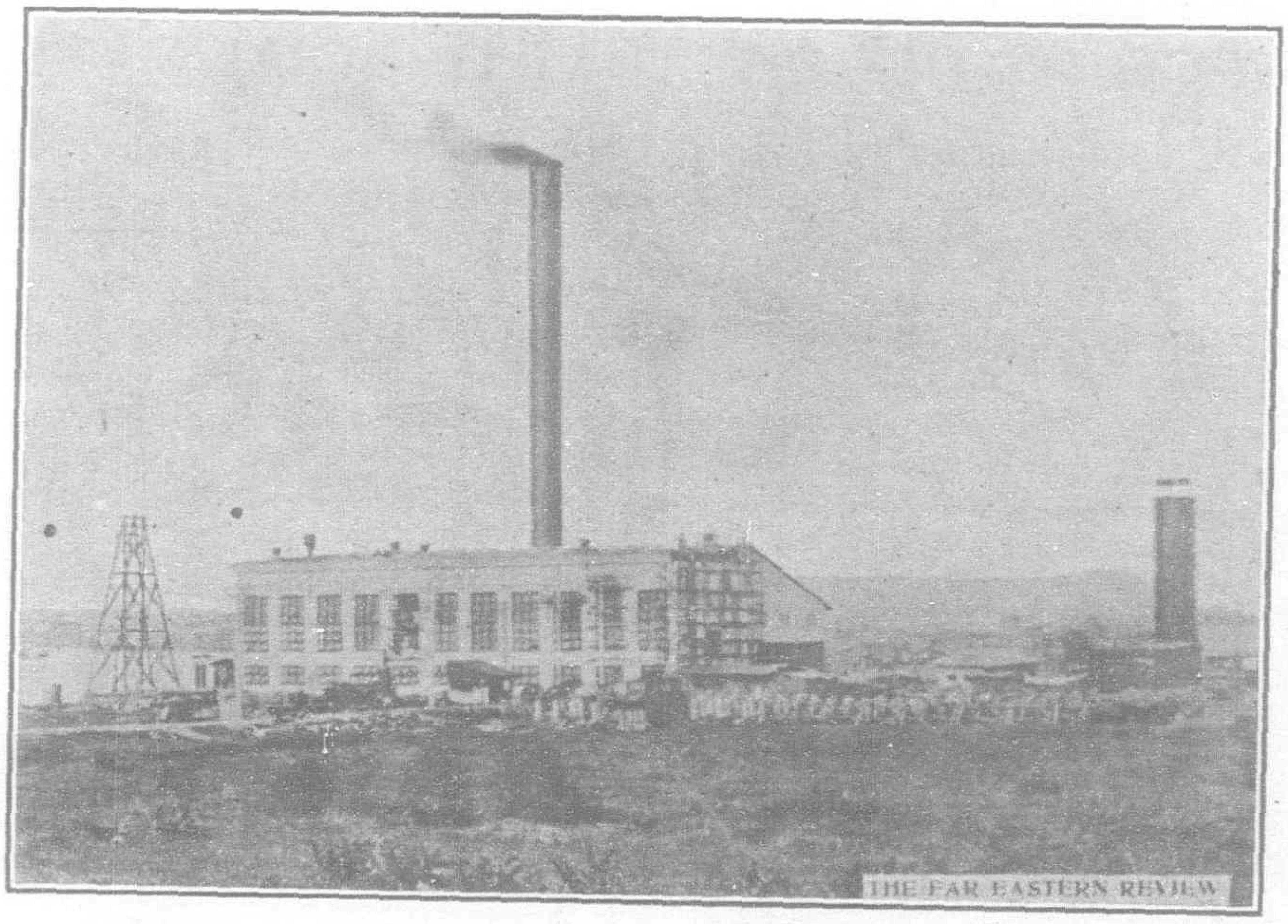
Construction Office for Work in the Far East
MANILA, PHILIPPINE ISLANDS

ENGINEERS
Cable Address: "Whitemanla"
CONTRACTORS

GENERAL CONSTRUCTION WORK

ELECTRIC TRAMWAYS
POWER PLANTS
ELECTRIC LIGHTING AND POWER
WATER POWER DEVELOPMENT
STEAM RAILROADS
RIVER AND HARBOUR IMPROVEMENT

DREDGING
DOCKS
WHARVES
PAVING
WATER SUPPLY
SEWERS
COAL HANDLING PLANTS



REPORTS MADE AND ESTIMATES FURNISHED

CONTRACTS IN THE PHILIPPINE ISLANDS:
COMPLETE RAILROAD AND ELECTRIC LIGHTING SYSTEM FOR THE MANILA ELECTRIC RAILROAD AND LIGHT COMPANY, MANILA—COMPLETED
WOOD BLOCK PAVING, ROSARIO AND ESCOLTA, MANILA—COMPLETED
CONCRETE STEEL BRIDGE, MANILA—COMPLETED
ILOILO HARBOUR IMPROVEMENT—UNDER CONSTRUCTION
CEBU HARBOUR IMPROVEMENT—UNDER CONSTRUCTION
TIMBER PIER AND WHARF, QUARTERMASTER'S DEPARTMENT, MANILA—UNDER CONSTRUCTION
COAL-HANDLING PLANT, OLONGAPO NAVAL STATION—UNDER CONSTRUCTION
STEAM RAILROADS, ISLANDS OF CEBU, NEGROS AND PANAY—SURVEYS NOW BEING MADE

The A. Butler Cement Tile Works, Ltd., Shanghai

MANUFACTURERS OF HIGH GRADE

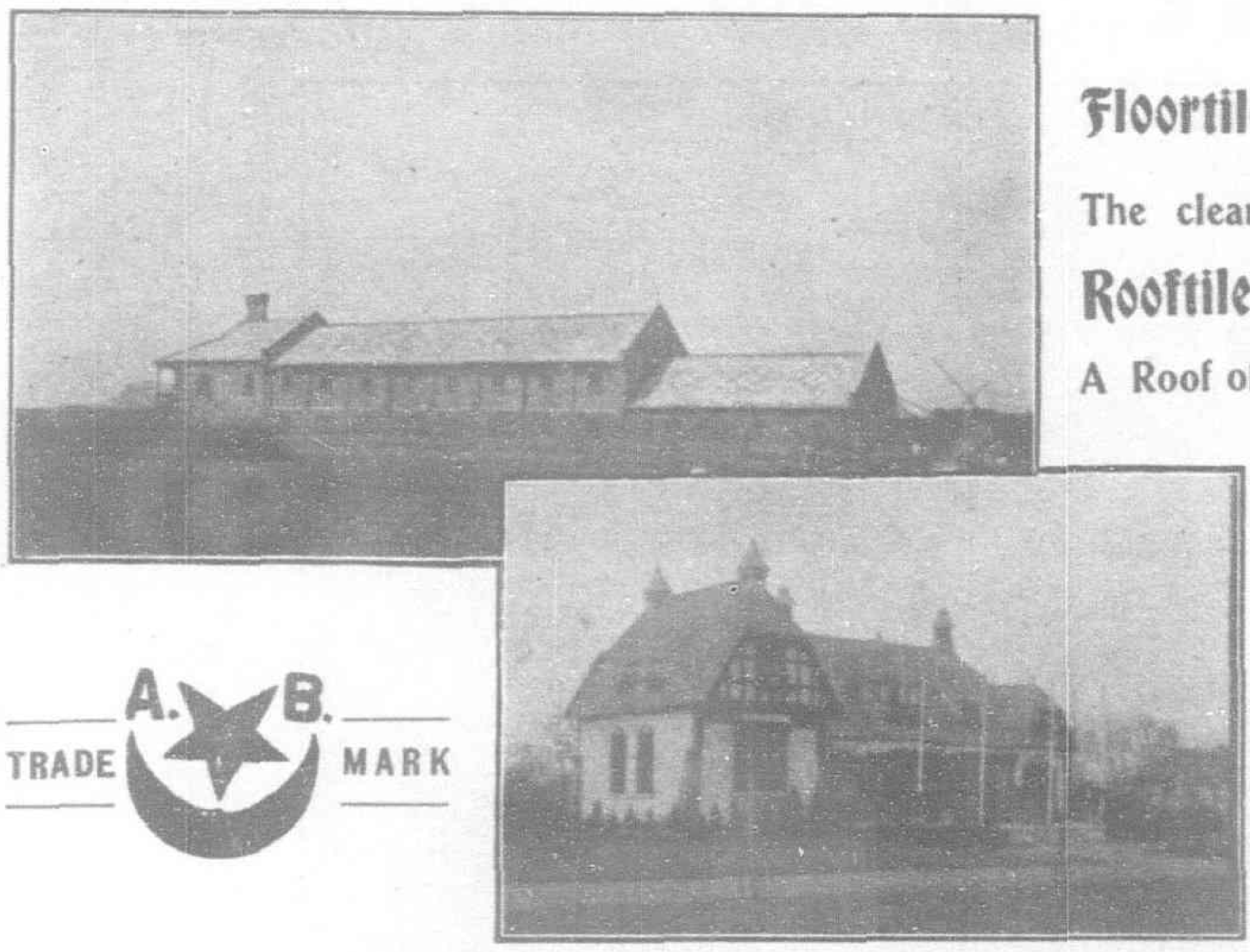
Floortiles: for verandahs, halls, vestibules, greenhouses, lobbies, kitchens, lavatories, bathrooms, pantries, etc., in an immense variety of colours and designs.

The cleanest and most sanitary floor. Artistic, tasteful, wellwearing and cheap.

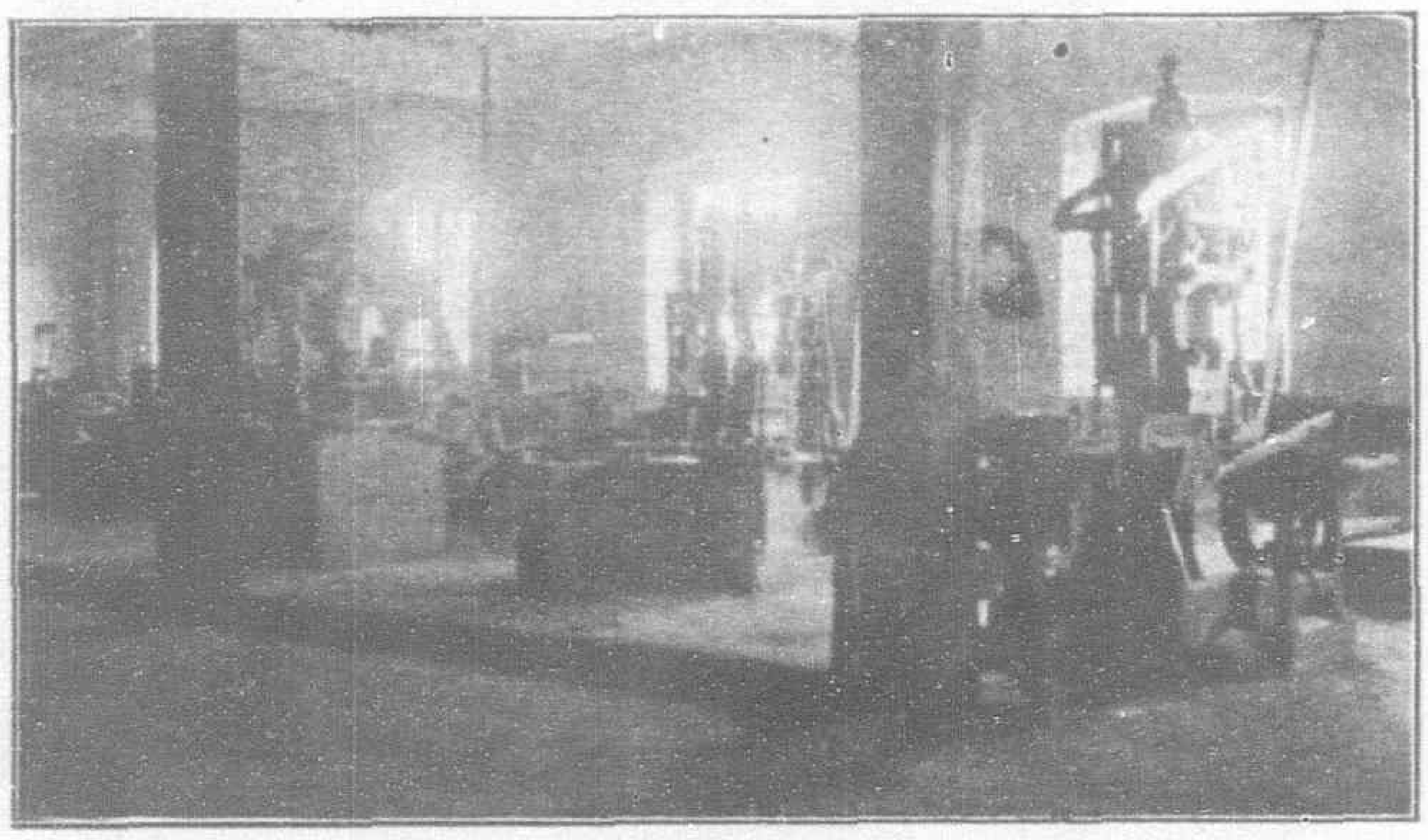
Rooftiles: fireproof and nonconducting, allowing for a good ventilation, yet safe in any weather; made in various shapes and any desired color.

A Roof of these tiles combines the advantages of iron, slate or any other roofing, but is cooler, prettier and cheaper.

Stable-Flooring: after the "Standard" pattern adopted by the British war office and all the leading stables of Europe.



A. B. TRADE MARK



Solid as granite, but easier kept clean and less slippery

Pavement Peates for outdoor paving

Ventilation and Foundation Bricks after any required design, conical, etc.

Agent and General Manager F. E. SCHNORR 45 Kiangse Road

"Trifles Make Perfection;

But Perfection Is No Trifle"

It is Just the Little Things which Most Manufacturers Consider Trifles that in Their Combined Qualities Produce the

STRENGTH, DURABILITY, AND SERVICEABLENESS OF BLANCO'S CARRIAGES

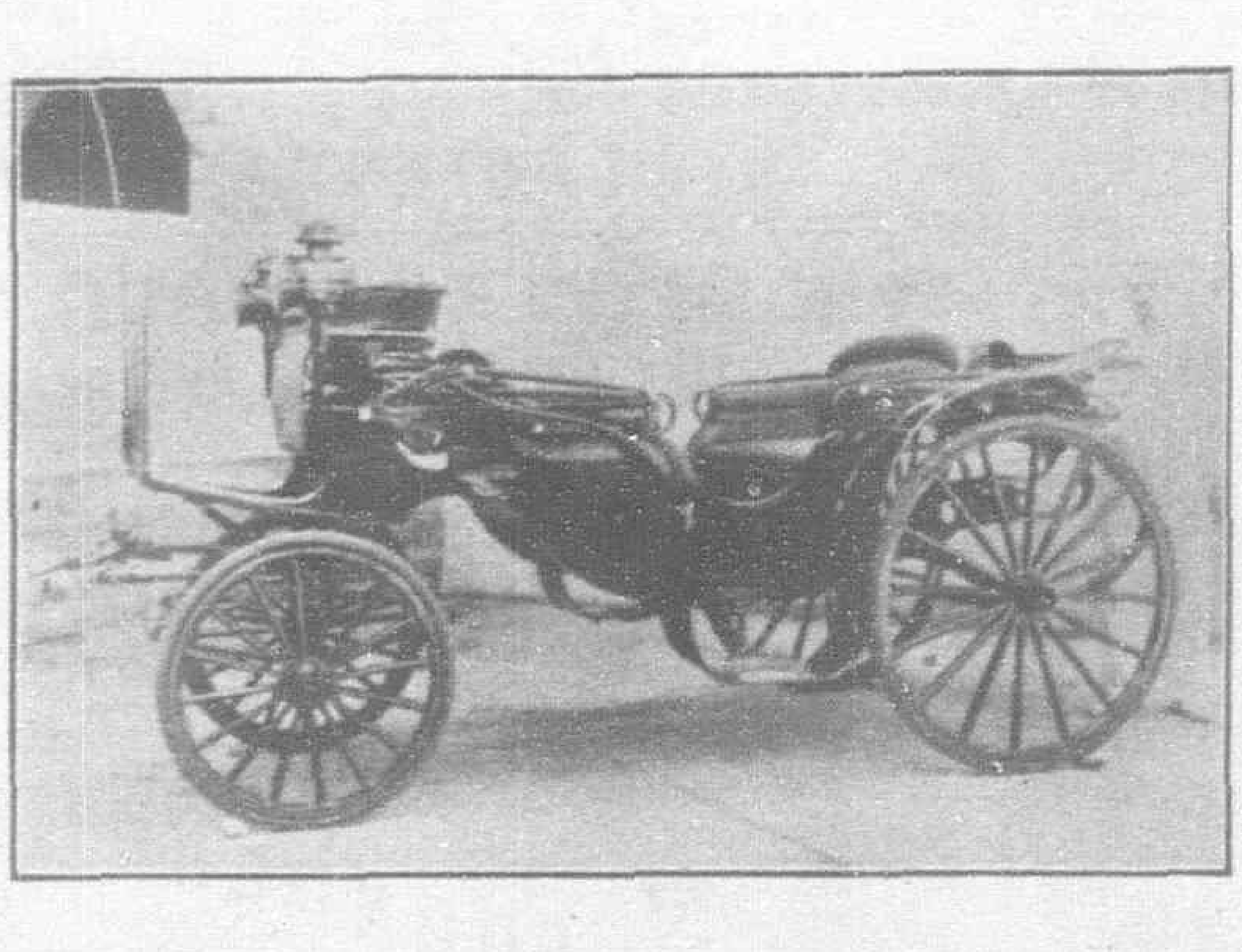
LA PARISIEN CARRIAGE MANUFACTORY

Telephone No. 399 340 CALLE PALACIO Manila, P. I.

Manufacturers of all Classes of Vehicles

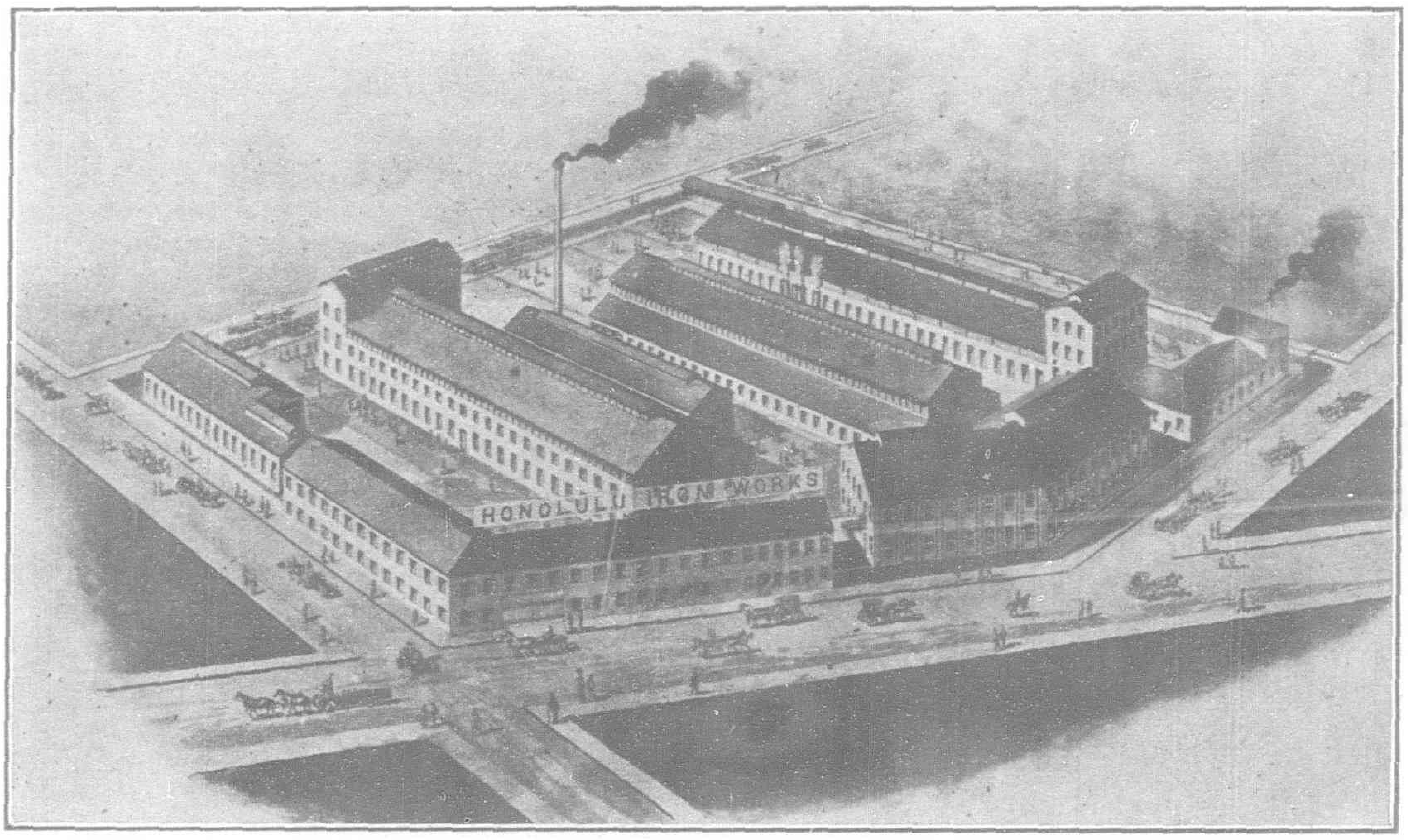
We Use The Famous
"GUIJO DE SAN MATEO"
Only the Very Best Materials,
AMERICAN AND FRENCH

Goodyear Rubber Tires



THE HONOLULU IRON WORKS CO.

HONOLULU, T. H.



VIEW OF WORKS, HONOLULU, T. H.

ENGINEERS, FOUNDERS AND MACHINISTS

COMPLETE OR PARTIAL SUGAR HOUSE INSTALLATIONS A SPECIALTY.

C. B. RIPLEY, AGENT, PARIS BUILDING, MANILA, P. I.

MITSU BISHI

DOCKYARD & ENGINE WORKS

NAGASAKI

CABLE ADD. "DOCK, NAGASAKI" A1, A.B.C. & ENGINEERING CODES USED.

DOCK No. 3.		DOCK No. 1.		DOCK No. 2.	
EXTREME LENGTH	722 FT.	EXTREME LENGTH	523 FT.	EXTREME LENGTH	371 FT.
LENGTH ON BLOCKS	714 "	LENGTH ON BLOCKS	513 "	LENGTH ON BLOCKS	360 "
WIDTH OF ENTRANCE, TOP	96½ "	WIDTH OF ENTRANCE ON TOP	88 "	WIDTH OF ENTRANCE ON TOP	66 "
" " " BOTTOM	88½ "	" " " " BOTTOM	77 "	" " " " BOTTOM	53 "
WATER ON BLOCKS AT SPRING TIDE	34½ "	WATER ON BLOCKS AT SPRING TIDE	26½ "	WATER ON BLOCKS AT SPRING TIDE	22 "

PATENT SLIP FOR VESSELS UP TO 1,000 TONS, GROSS.

THE BEST EQUIPPED SHIPBUILDING PLANT IN THE FAR EAST,

WITH SPECIAL FACILITIES FOR HANDLING THE HEAVIEST CASTINGS AND THE REPAIRING OR BUILDING OF SHIPS, ENGINES AND BOILERS, ALSO ELECTRICAL WORK.

LARGE STOCK OF MATERIAL, AND FITTINGS ALWAYS ON HAND.

THE POWERFUL SALVAGE STEAMER "OURA-MARU" (712 TONS, 700 I. H. P.). EQUIPPED WITH NECESSARY PUMPS AND GEAR, IS ALWAYS READY AT SHORT NOTICE.

ENGINEERS ⚜ FOUNDERS ⚜ SHIPBUILDERS ⚜ BOILERMAKERS ⚜ ELECTRICIANS

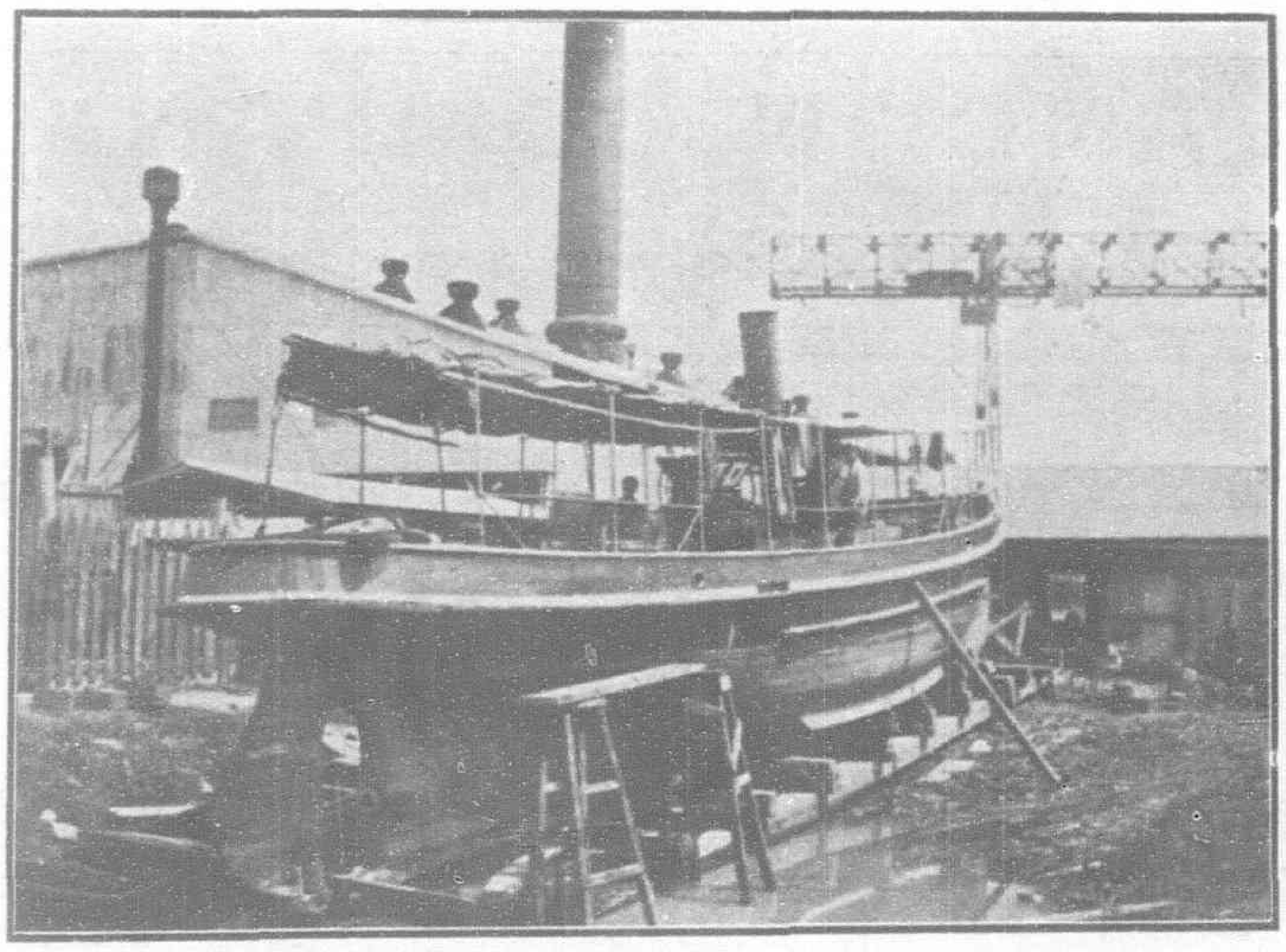
SAN NICOLAS IRON WORKS, LTD.

MANILA, P. I.

ENGINEERS AND BOILERMAKERS

All Kinds of Repairs to Machinery, Engines and Woodwork Undertaken

CASTINGS A SPECIALTY



SLIPWAY OF THE SAN NICOLAS IRON WORKS

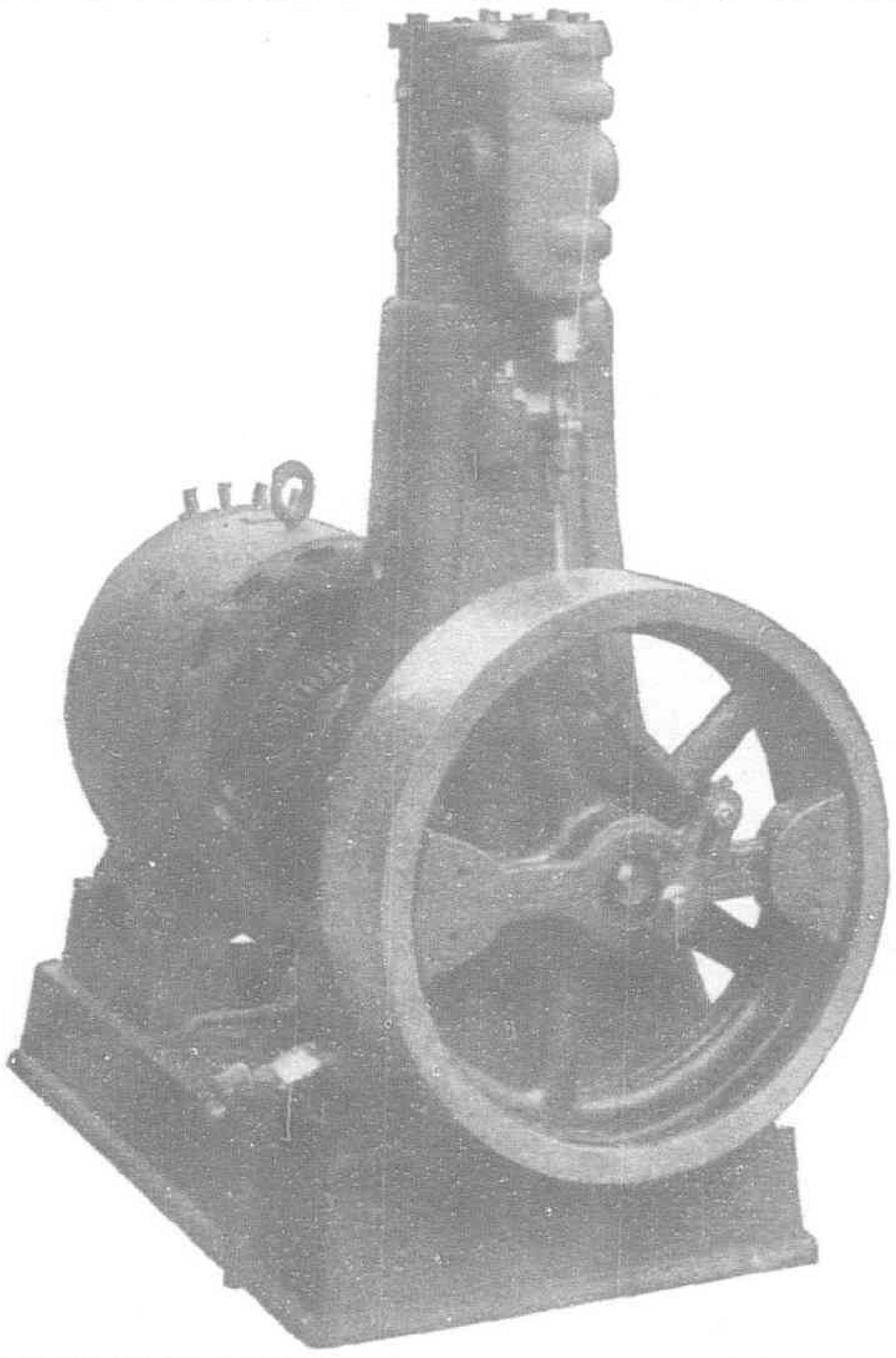
Launches, Lorchas, Cascoes and Barges
Repaired and Built on Reasonable Terms

WORKS AND FOUNDRY
17 Peñarubia—Binondo

SMITH, BELL & CO.
General Managers
2 Carenero—Binondo

ALLIS-CHALMERS COMPANY

MILWAUKEE, WISCONSIN, U. S. A.



Complete Equipments for

MINING, MILLING AND SMELTING

DIRECT AND ALTERNATING CURRENT APPARATUS FOR ALL PURPOSES

PUMPING MACHINERY

GAS ENGINES

STEAM TURBINES HYDRAULIC TURBINES

REYNOLDS CORLISS ENGINES

ALL TYPES—ALL SIZES—FOR ALL SERVICES

CEMENT MACHINERY HYDRAULIC DREDGES

GOLD DREDGES STEAM SHOVELS

BRYAN LANDON COMPANY MANILA

AGENTS FOR THE PHILIPPINE ISLANDS

OFFICES:
New York San Francisco
Seattle Manila

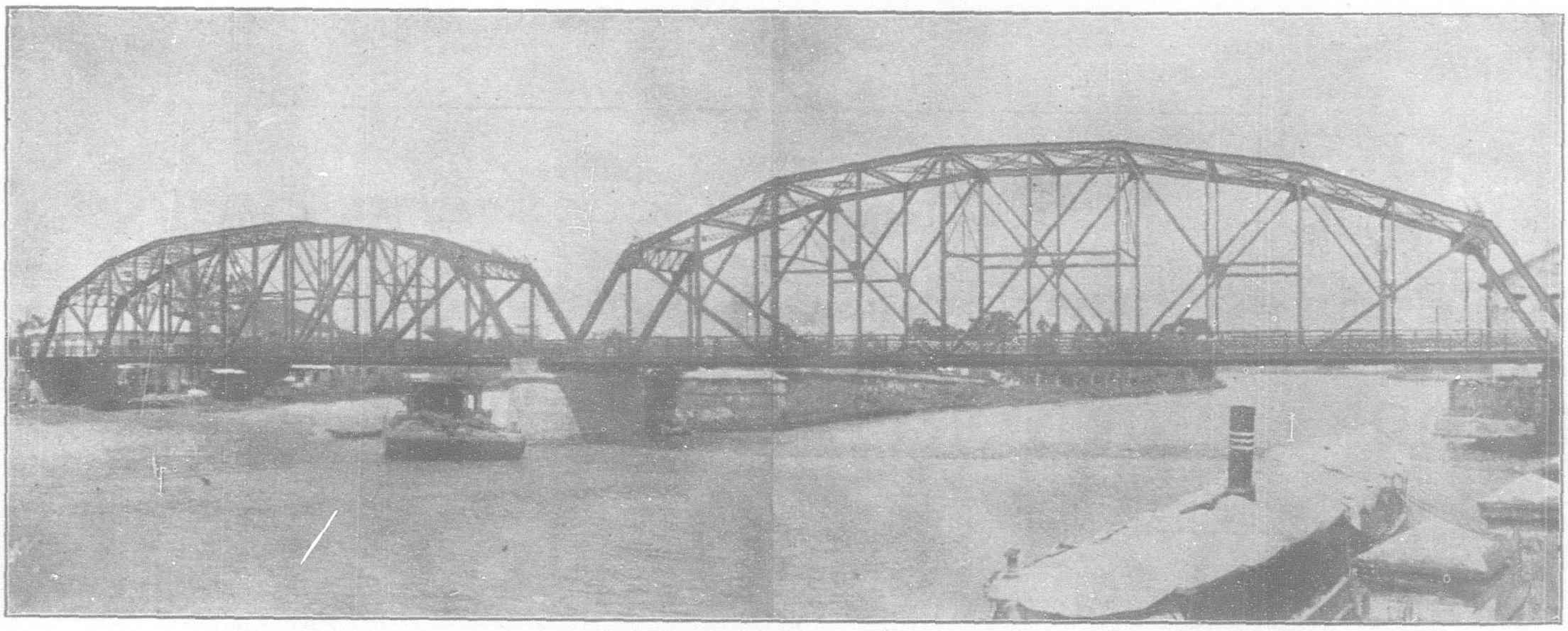
MANILA OFFICES:
Corner Malecon Drive and Pasig River

ATLANTIC, GULF AND PACIFIC COMPANY

(Incorporated)

ENGINEERS AND CONTRACTORS

BRIDGE BUILDERS



Ayala Bridge over the Pasig River, Manila, erected by the Atlantic, Gulf and Pacific Co.

BEAR BRAND
FRESH-MILK

A Pure Cow's Milk Put Up
In Pint and Quart Tins

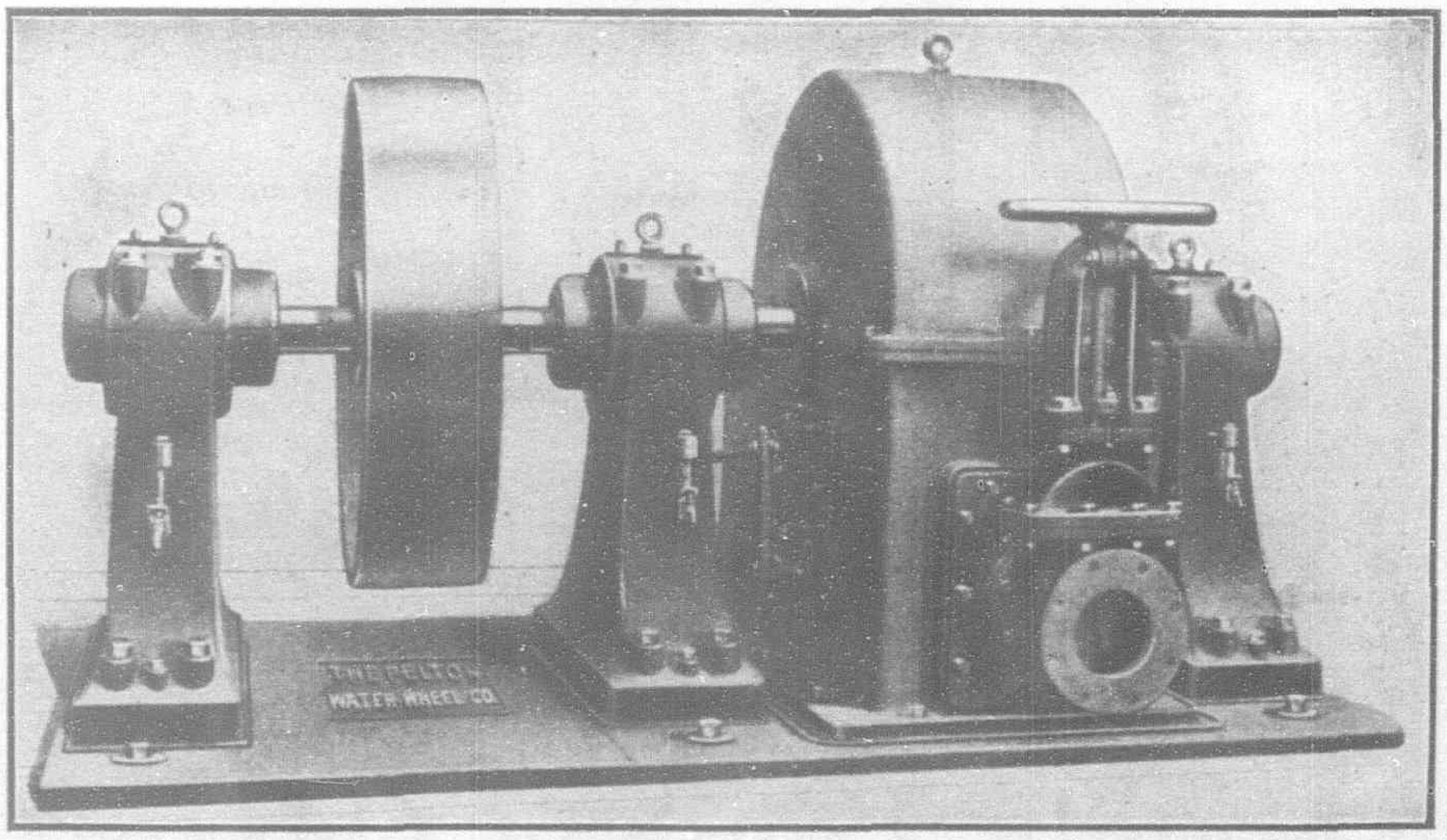
SPRUNGLI & CO.
IMPORTERS

28 Calle David, Manila

CHEAP POWER FOR THE HACIENDA!

THE
PELTON
WATER
WHEEL

WILL SOLVE THIS PROBLEM. A SMALL STREAM AND A FEW HUNDRED FEET OF PIPE IN CONNECTION WITH THIS WHEEL MAY AFFORD ALL THE POWER YOU REQUIRE



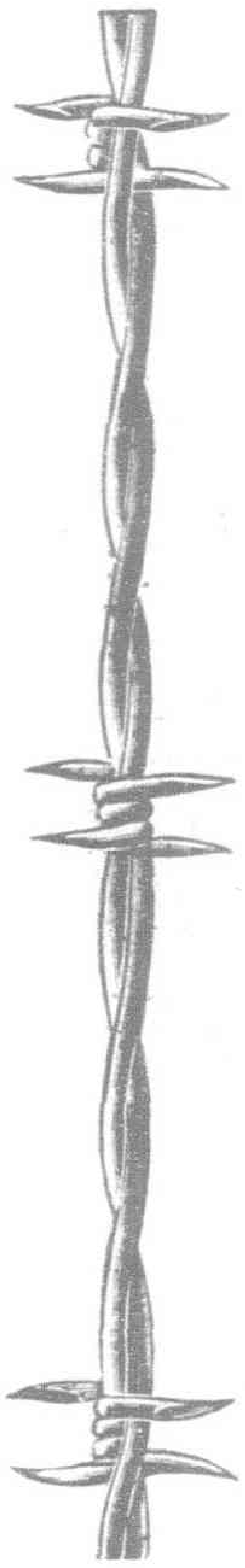
PELTON WHEELS ARE ADAPTED TO ELECTRIC POWER TRANSMISSION, MINING AND ANY PURPOSE REQUIRING POWER. SEND FOR FULL CATALOG ON WATER POWER DEVELOPMENT

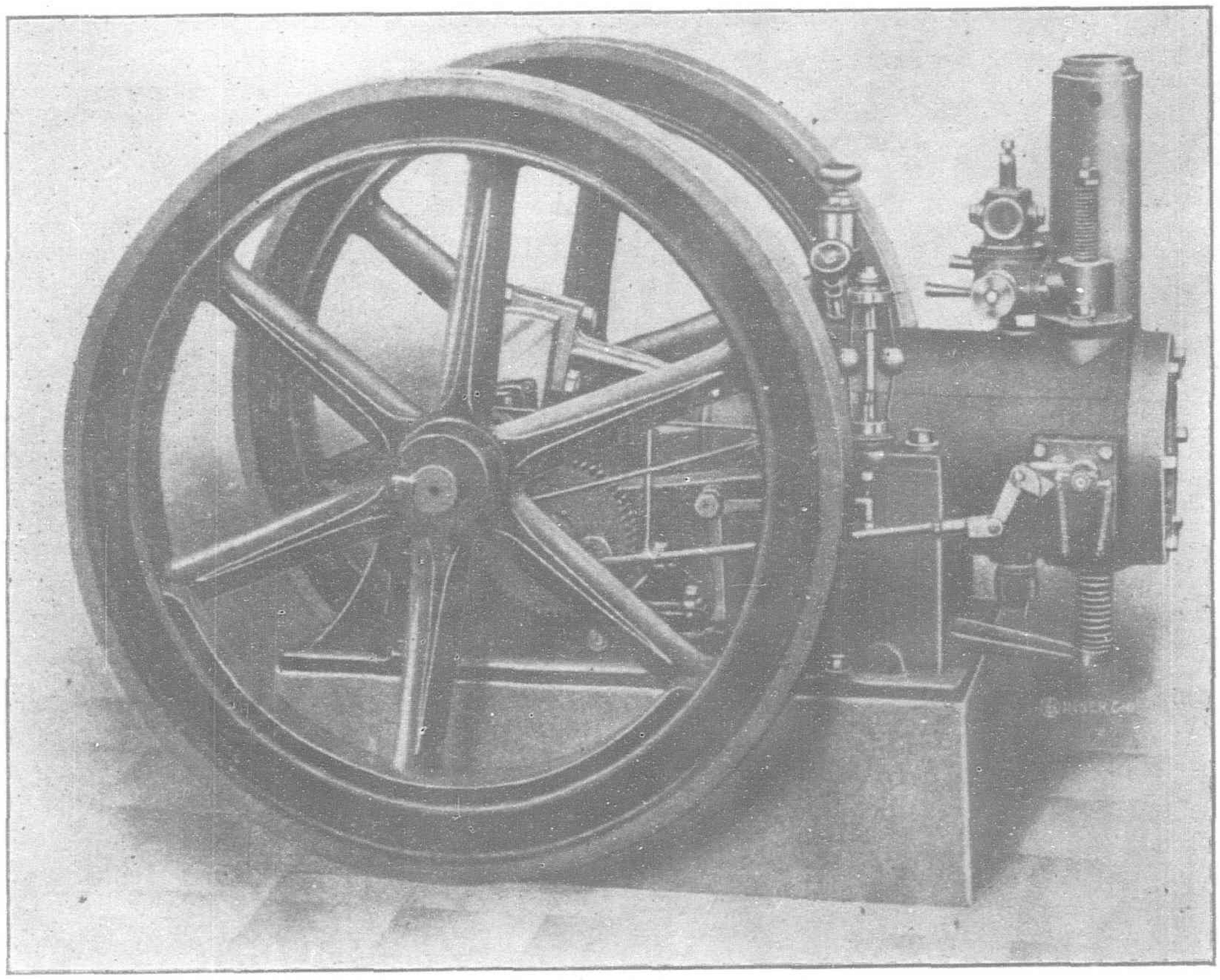
Cable Address:
"PELTON"
San Francisco
Codes: A. B. C.
Lieber: PELTON

Grant & Co., Ltd.
MANILA, P. I.

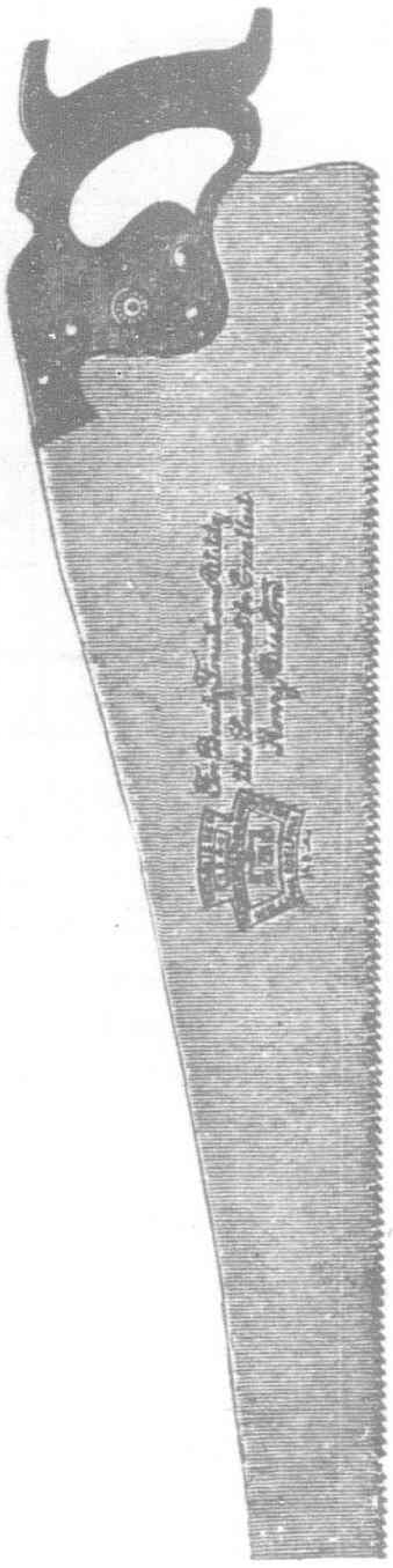
THE PELTON WATER WHEEL CO.
19TH AND HARRISON STS., SAN FRANCISCO, CAL., U. S. A.

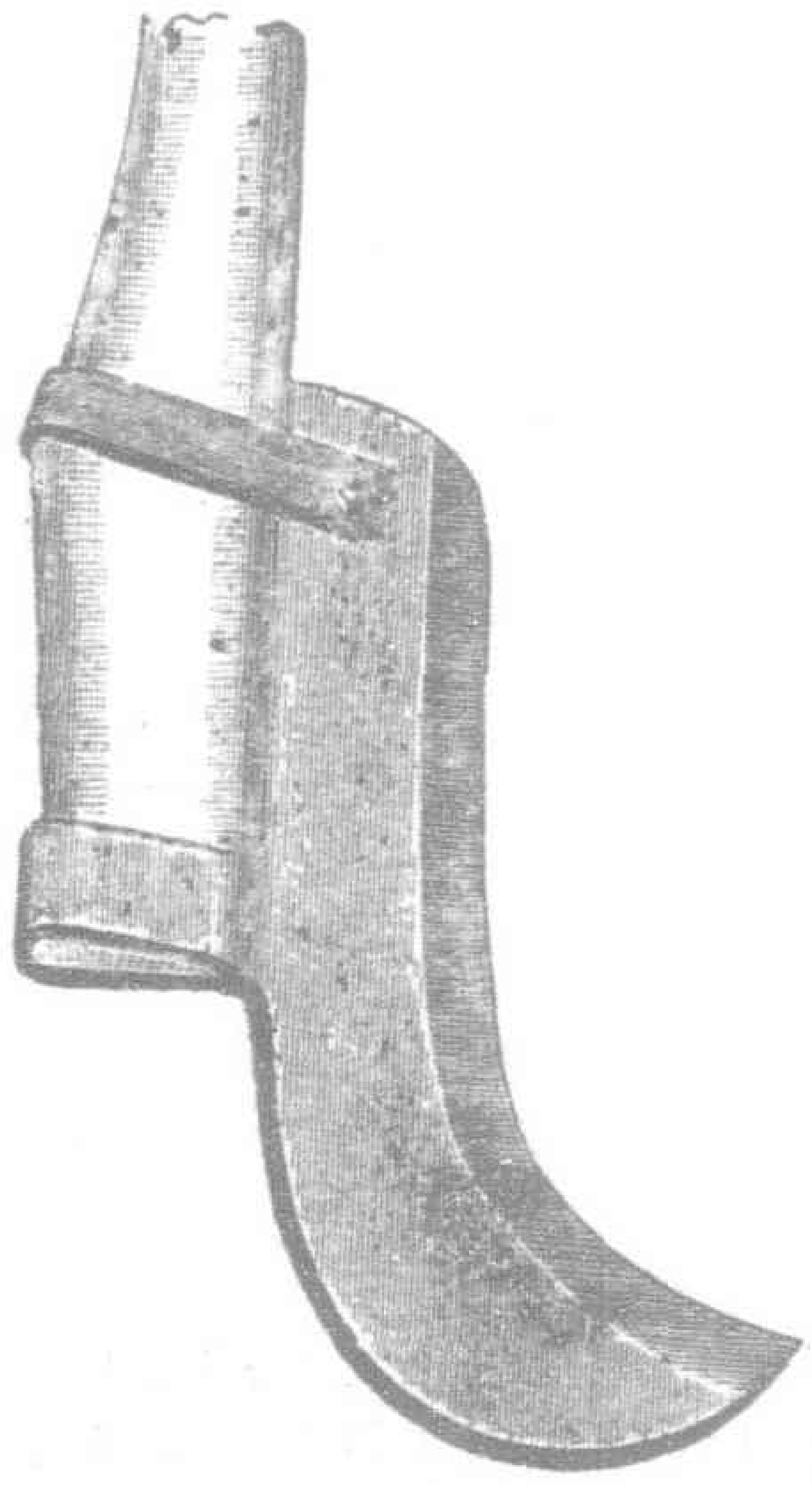
Kerkoven & Mazel
TJIBADAK—JAYA





GASOLINE ENGINE





Special Agents for the Orient

C. A. Hooper & Co., S. F.

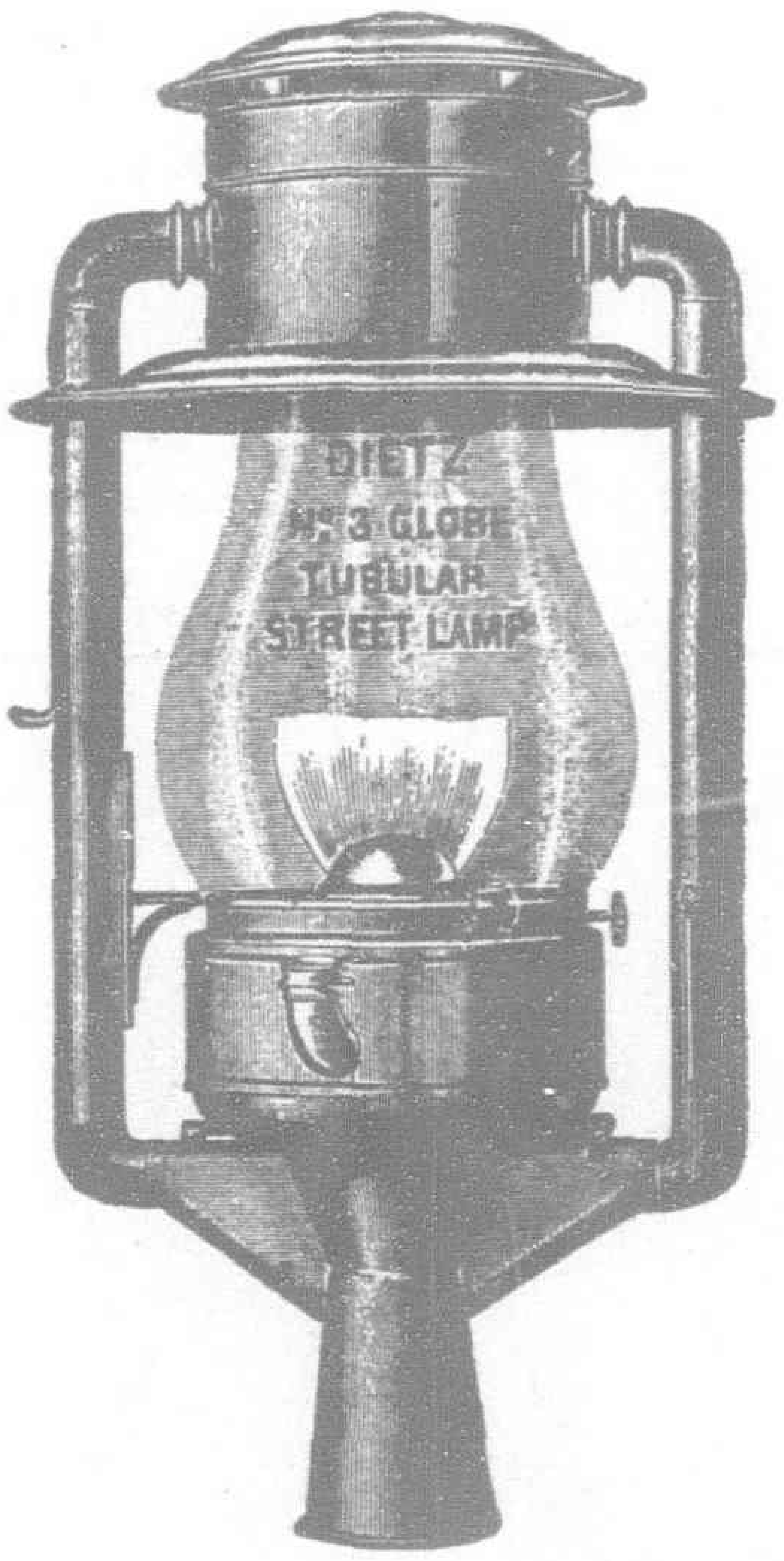
Excelsior Redwood Co., S. F.

Pope & Talbot, S. F.

Goodyear Tire and Rubber Co.

Queen City Wheel Co.

Paraffine Paint Co.



Port Gamble and Port Ludlow Mills.

Renton, Holmes & Co., S. F.

Port Blakely Mills.

Malthoid Roofing

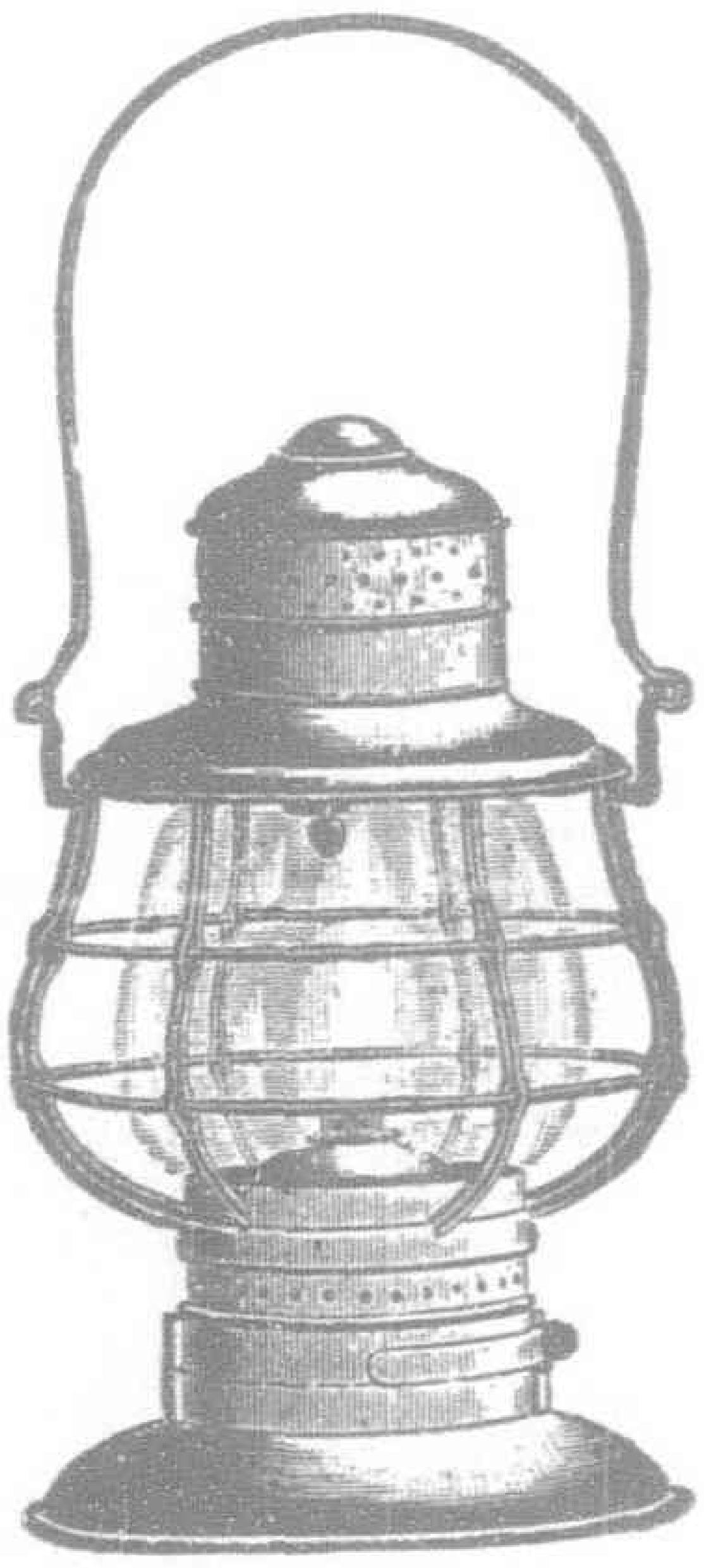
Hardware Mfg.

Paint Manufacturers.

Glass Manufacturing.

Oil Manufacturing.

Everything in the Building Line



CABLE ADDRESS:
"HOOPTON"

Codes: Western Union, A. B. C.,
A No. I, Lumberman's, Hannify's

California-Manila Lumber Commercial Co.

MANILA, P. I.

New Wholesale and Retail Store

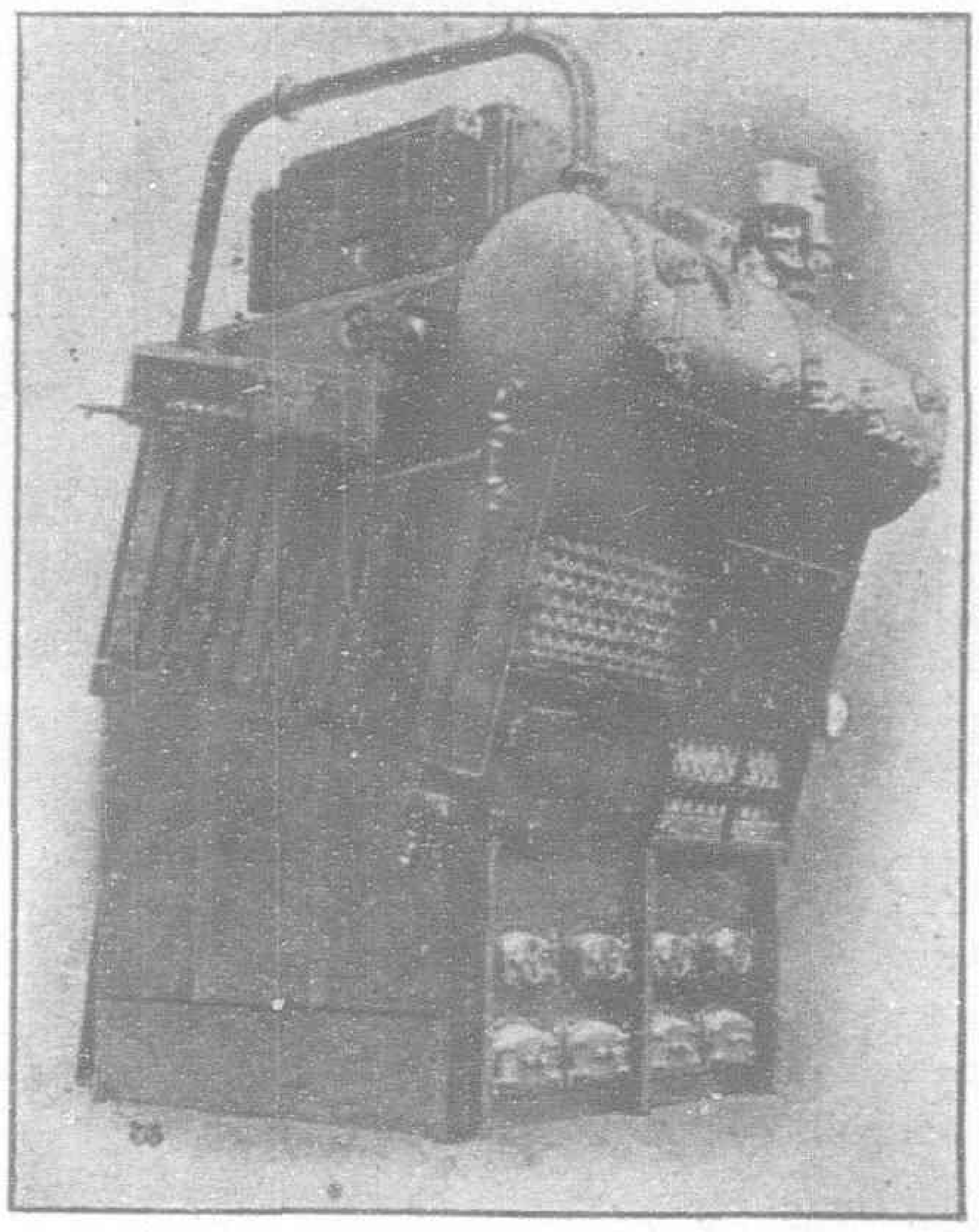
32 Plaza Moraga

BABCOCK AND WILCOX, LTD.

PATENT WATER-TUBE STEAM BOILERS

5,000,000 H. P. IN USE

Some installations in China:—
Electric Light Works, Hongkong.
Green Island Cement Works, Hongkong.
Green Island Cement Works, Macao.
China Light and Power Co., Canton.
Municipal Electric Light Works, Shanghai.
Electric Light Works, Tientsin.
Electric Light Works, Pekin.
Electric Light Works, Hankow.
Pekin Syndicate Mines, Takoo.
S. Pearson and Son, Ltd., Railway Works and many others.



MARINE TYPE FOR LAND PLANTS

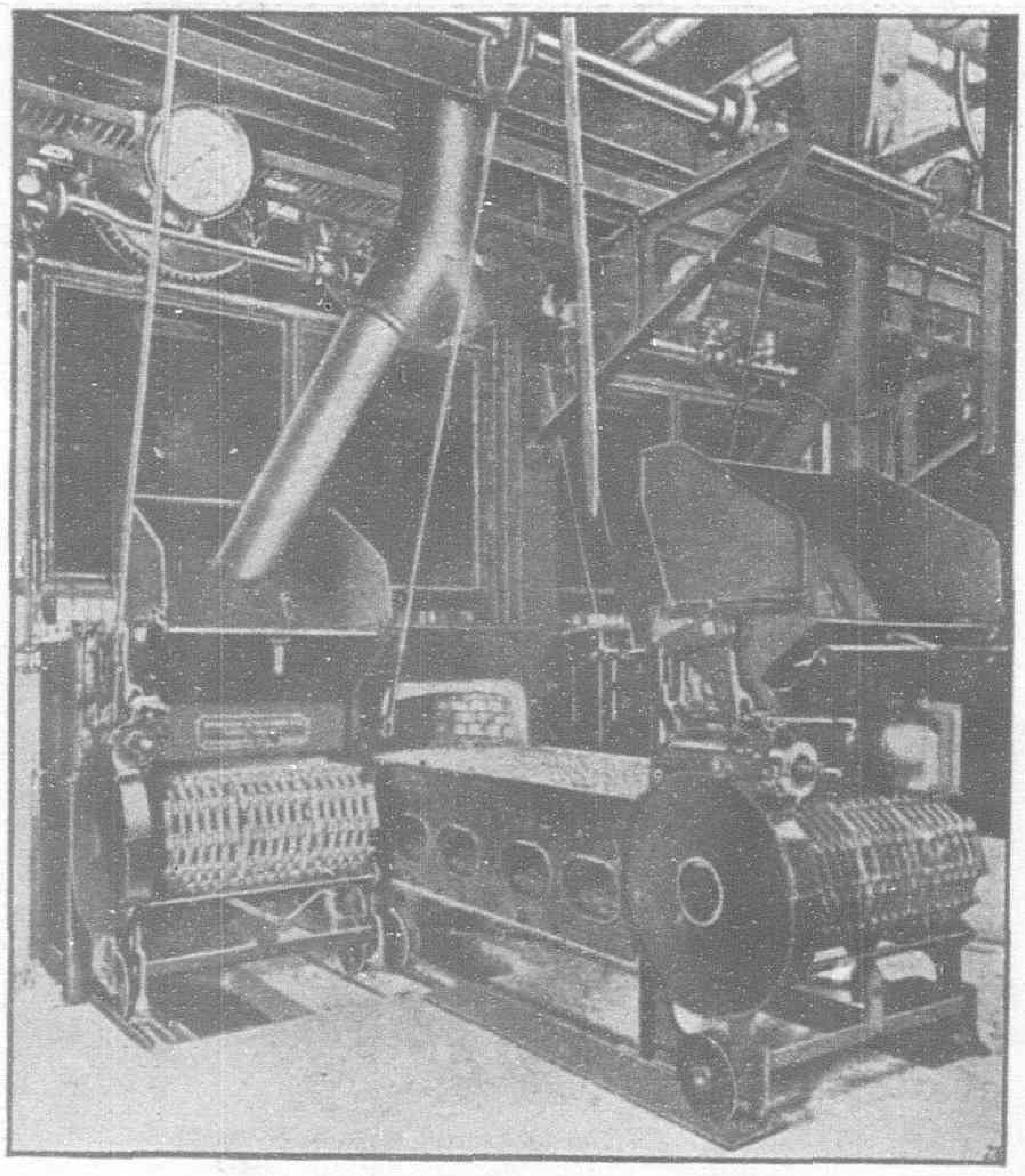
Superheaters.
Feed-Water Heaters.
Economisers.
Steam Piping.
Steel Chimneys.
Water Purifiers and Softeners.
Coal-Conveying Machinery.
General Boiler-House Accessories.

Patent Chain Grate Mechanical Stokers

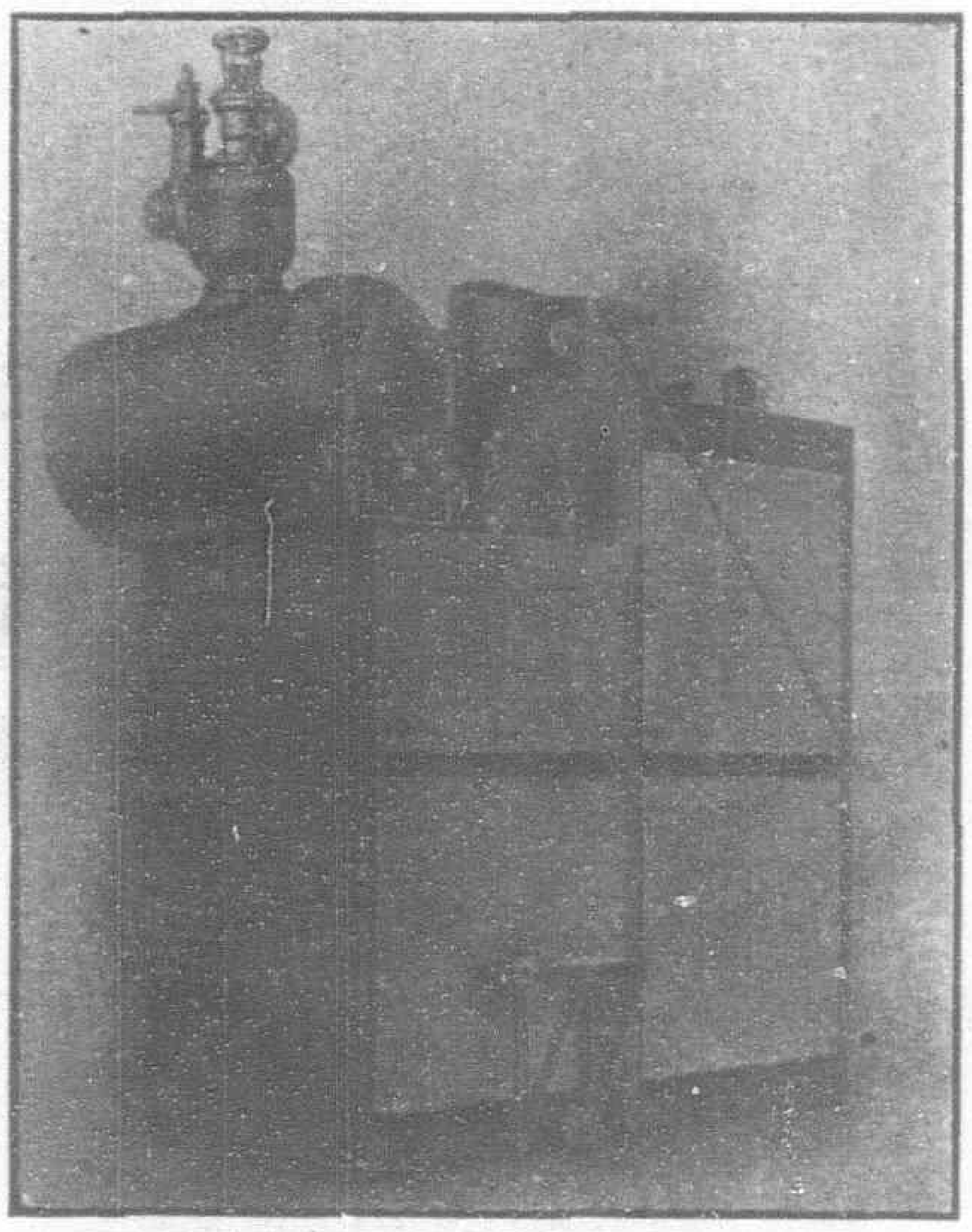
SMOKELESS COMBUSTION and **HIGH EFFICIENCY** with Bituminous Coal. Continuous Working, Low Cost of Upkeep, Self-Clinkering and Easy Manipulation.

Extract from 1904 Report of F. H. W. Aldridge, Municipal Electrical Engineer of Shanghai:

"It will be learnt with pleasure that the operation of the **MECHANICAL STOKERS** in the new Boiler (B. & W.) has so far successfully overcome the smoke nuisance. With this boiler working the emission of black smoke from the chimney shaft is entirely absent, only a thin white vapour at times being visible."



MANCHESTER CORPORATION ELECTRICITY WORKS, STUART STREET



PORTABLE TYPE, REAR VIEW

Patent Portable Boilers

Specially constructed for use in mountainous districts, and shipped in small packages of light weight, no parcel exceeding two hundred lbs. in weight for easy transport by Cart, Coolies or Mule-back.

Cross Type Boilers

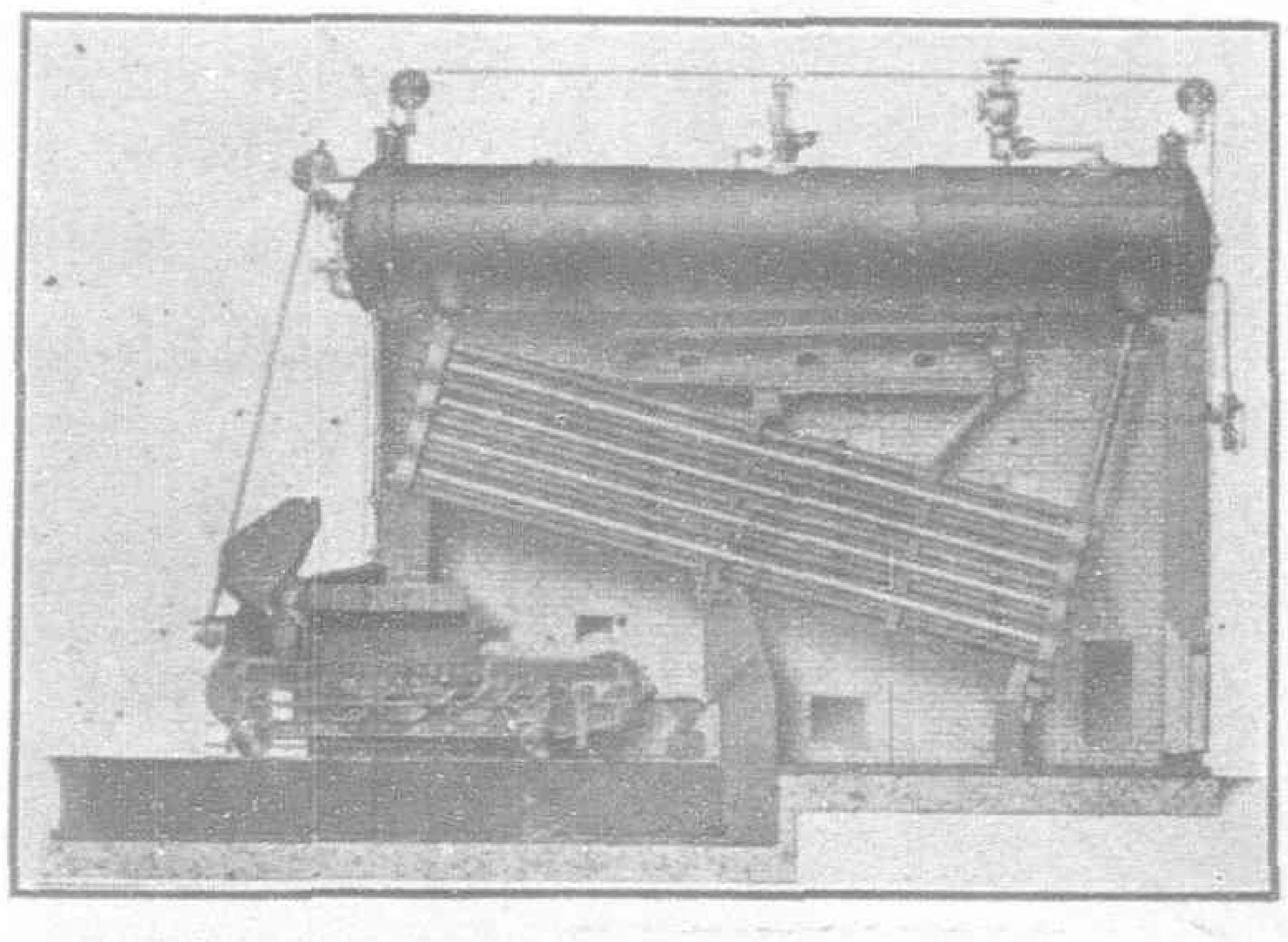
As supplied to the Pekin Syndicate Mines in Honan can be sectionalized so that no piece exceeds two hundred and fifty lbs. in weight.

Marine Boilers

Specially suitable for light draught and river steamers, where economy in weight and space is of importance.

Marine Type For Land Purposes

Is frequently used in Electricity Works, and occupies less space for the horse power generated than their Standard Land Type Boiler. As supplied to the Shanghai Municipal Electric Light Works.



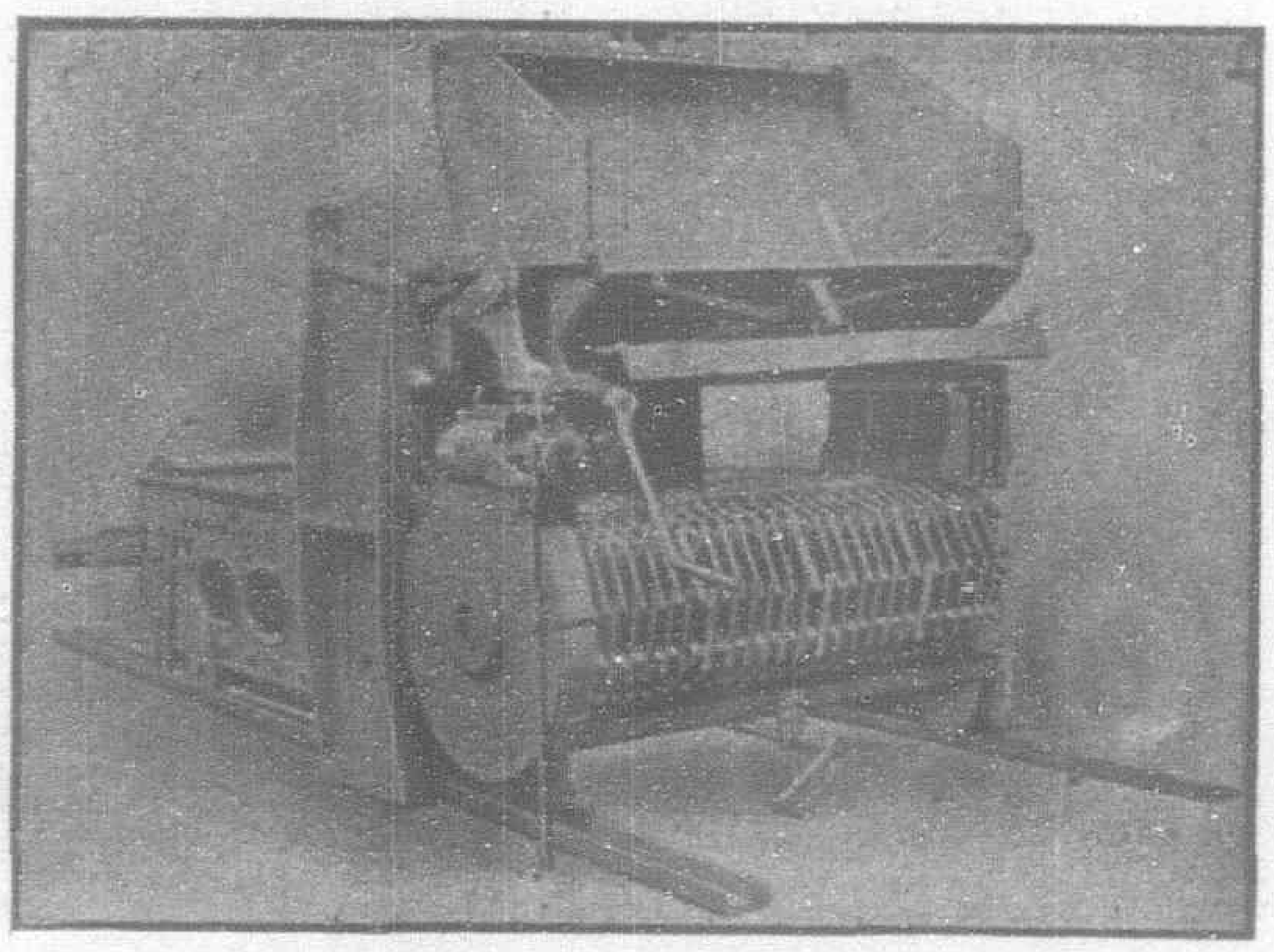
PATENT WATER-TUBE LAND BOILER, FITTED WITH PATENT INTEGRAL SUPERHEATER, LAND PATENT MECHANICAL CHAIN GRATE STOKER

STEEL AND IRON

Chimneys, self supporting or stayed, of any height or size.

BOMBAY OFFICE

Weeler's Bldgs. Hornby Rd.
BOMBAY



BABCOCK & WILCOX PATENT MECHANICAL CHAIN GRATE STOKER (WITH FIRE-DOOR OPEN)

POOLE, LAUDER & CO.

SHANGHAI, TIENTSIN, HANKOW

Representatives for the Chinese Empire

KOBE
CANTON
HONGKONG
SHANGHAI
NEW YORK

SHEWAN TOMES & Co

LONDON
OFFICE
YORK HOUSE
5 AND 7
ST. MARY AXE
LONDON, E. C.

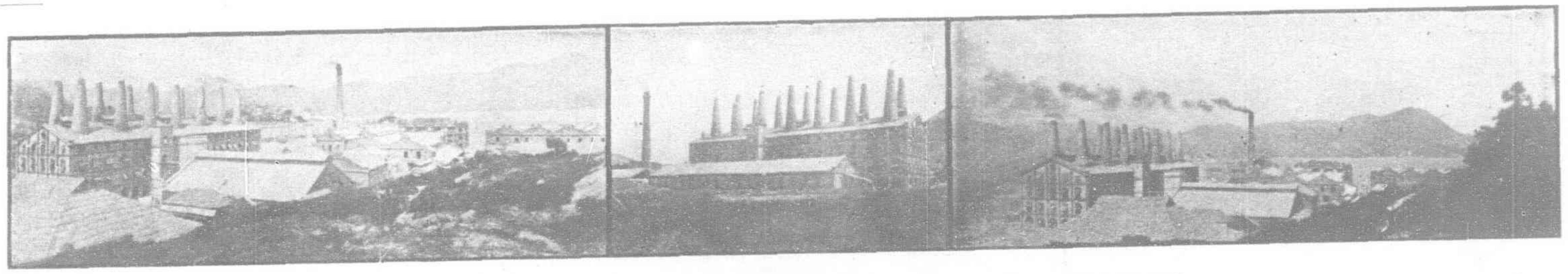
IMPORT AND EXPORT MERCHANDISE, COMMISSION AND SHIPPING AGENTS

Telegraphic Address:
"KEECHONG," Hongkong.

Post Office Box:
No. 131B.

GENERAL MANAGERS OF

- The China Light & Power Co., Ltd., Hongkong
- The Green Island Cement Co., Ltd., "
- The Hongkong Rope Mfg. Co., Ltd., Hongkong
- The China Provident Loan & Mortgage Co., Ltd., Hongkong
- The China and Manila Steamship Co., Ltd., Hongkong
- The Canton Land Co., Ltd.
- Equitable Life Assurance Society of the United States Hongkong



WORKS OF THE GREEN ISLAND CEMENT COMPANY, LIMITED, HONGKONG

GLAZED
STONEWARE

HOUSE
DRAIN
AND
SEWER PIPES
AND
FITTINGS
IN STOCK

GLAZED
PAVING BRICKS
AND
TILES

FIRE
BRICKS
AND
FIRE CLAY

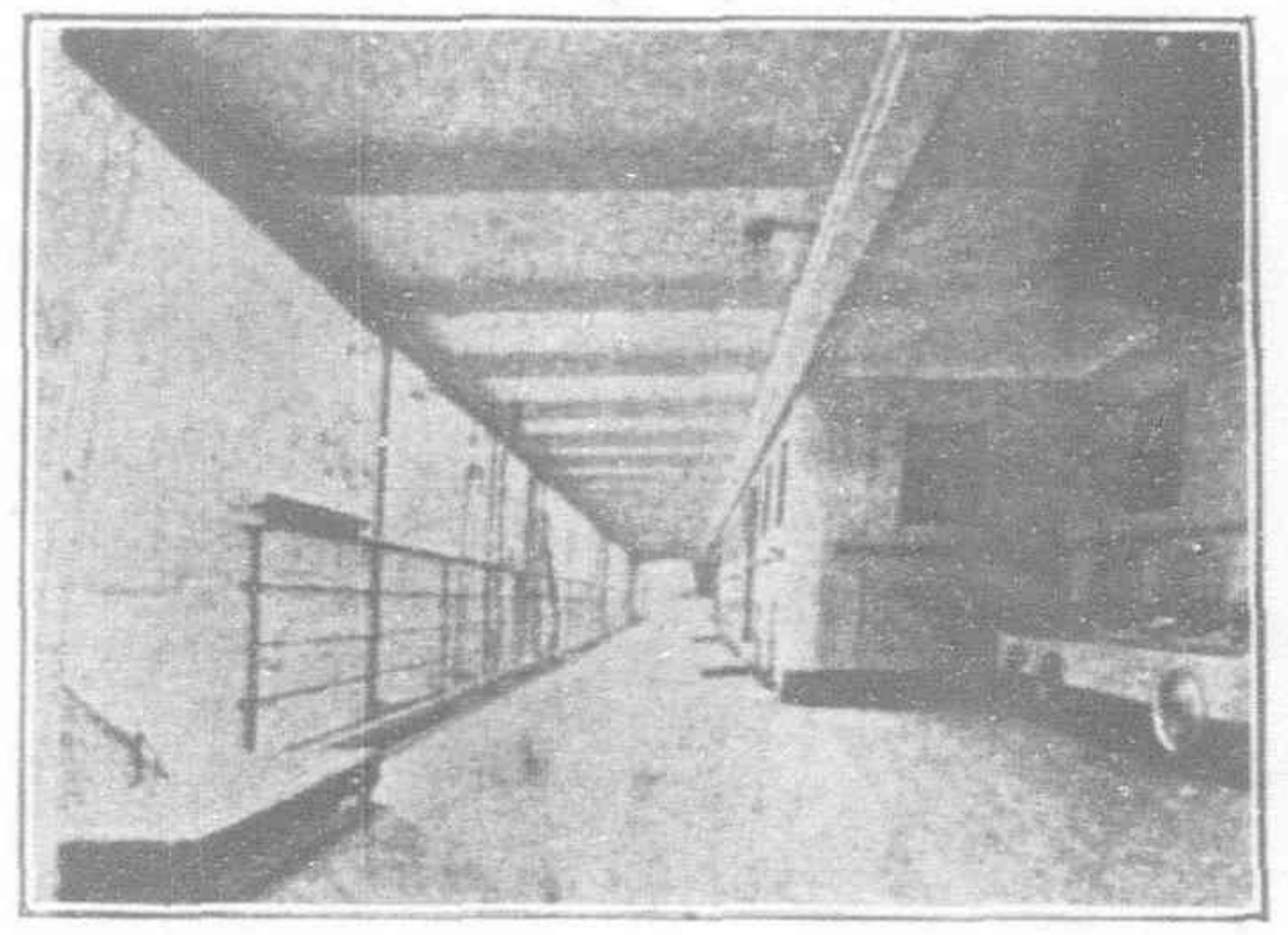
AGENTS:

Manila, P. I.	Wm. H. Anderson & Co.	Tientsin, Formosa, etc.	Jardine Matheson & Co.	Calcutta	Turner, Morrison & Co.
Shanghai	Shewan, Tomes & Co.	Singapore Penang	McAlister & Co., Ltd.	Bombay	E. Spinner & Co.
Japan	Shewan, Tomes & Co.			Rangoon	Geo. Gillespie & Co.

AGENTS FOR

- Jenkins & Co.'s "Shire" Line of Steamers
- J. Marke Wood's Line of Steamers
- The Yangtsze Valley Company, Ltd.
- The Hongkong Tramways Electric Company, Ltd.
- The American China Development Co.
- The Yangtsze Insurance Association, Ltd.
- World Marine Insurance Co.
- Reliance Marine Insurance Co.
- Union Marine Insurance Co., Ltd.
- Batavia Sea and Fire Insurance Co.
- North British & Mercantile Insurance Co.
- Law Union & Crown Insurance Co.
- Yorkshire Fire and Life Insurance Co.
- Fireman's Fund Insurance Co. (Fire only.)
- Insurance Company of North America
- The Chinese Engineering and Mining Company, Ltd.
- Shanghai Pulp and Paper Co., Ltd.
- Canton & Hongkong Tug, Lighter & Ferry Co., Ltd.
- Tacoma Grain Co.

CHINA AND MANILA S. S. COMPANY, LIMITED



UPPER PROMENADE DECK.

HONGKONG TO MANILA

THE NEWEST, FASTEST, AND MOST LUXURIOUS STEAMERS PLYING BETWEEN HONGKONG AND MANILA. BUILT IN 1901, ALL LATEST IMPROVEMENTS—ACCOMMODATION AMIDSHIPS—ELECTRIC LIGHTS, FANS, ETC. : : : : : : : : : :

STEAMERS

"ZAFIRO" "RUBI"

WEEKLY SAILINGS. ONLY TWO NIGHTS AT SEA

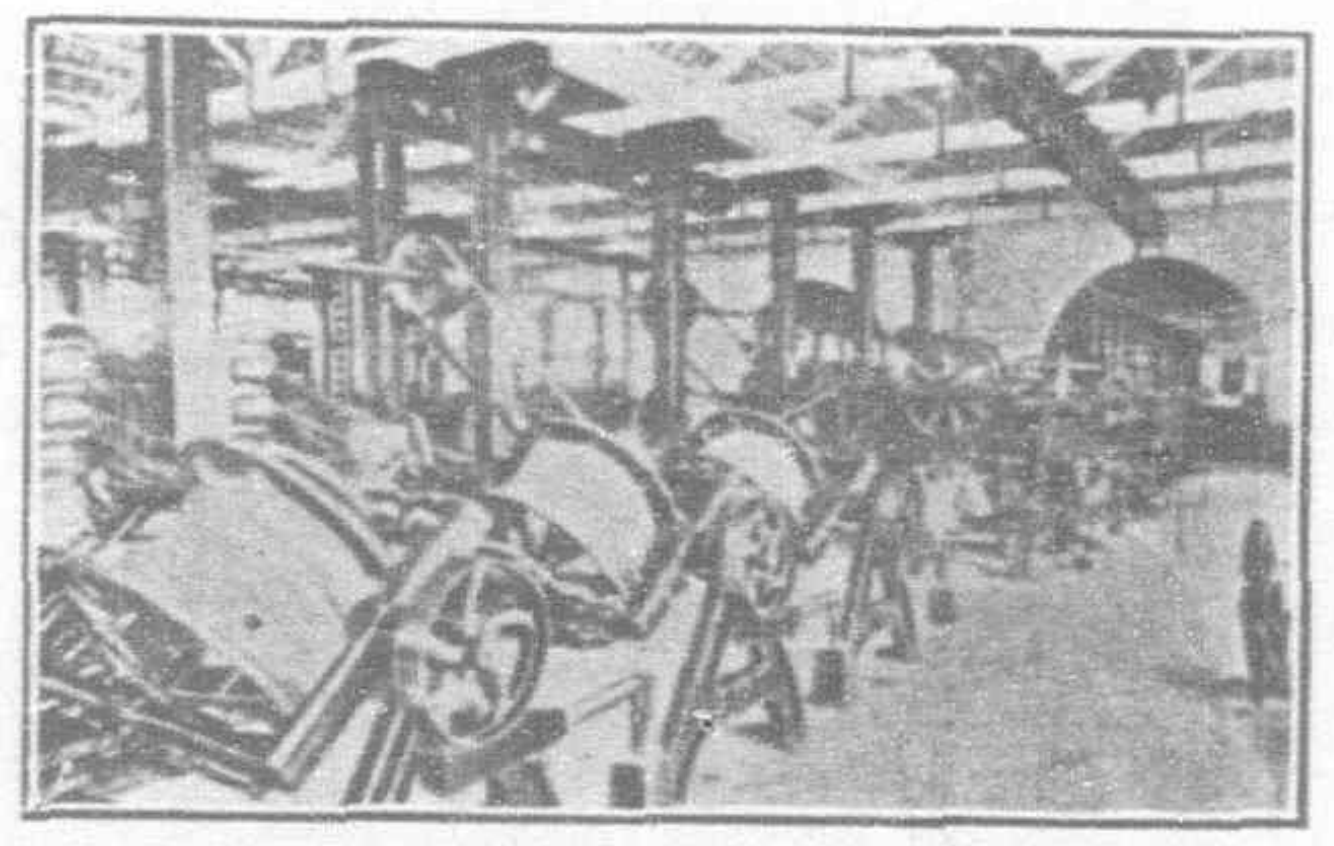
SHEWAN, TOMES & CO.—GEN. MGRS.
HONGKONG

AGENTS

WARNER, BARNES & CO., LD.
MANILA

TAIT & CO.
AMOY

HONGKONG ROPE MANUFACTURNIG COMPANY, LTD.



ROPE FACTORY.

PURE MANILA ROPE

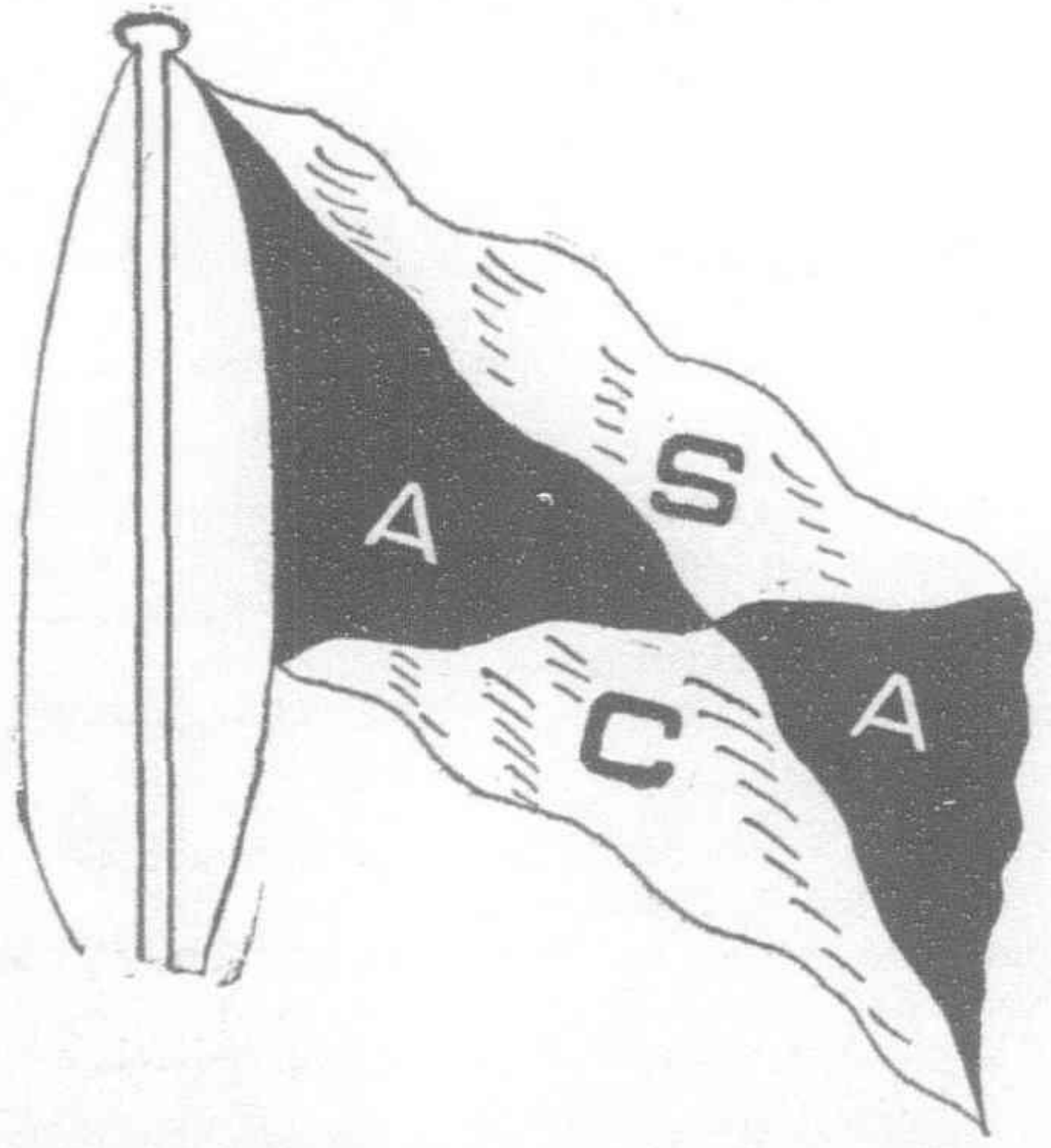
MADE FROM ONLY THE BEST WHITE MANILA HEMP.

USED BY THE BRITISH NAVY ON THE CHINA STATION, AND BY THE MAIL AND LEADING LINES OF STEAMERS

SHEWAN, TOMES & CO.

GENERAL MANAGERS

AMERICAN ASIATIC STEAMSHIP CO.



REGULAR MONTHLY SAILINGS VIA SUEZ CANAL, BETWEEN

NEW YORK, ADEN, STRAITS SETTLEMENTS, MANILA, CHINA AND JAPAN,

RETURNING TO NEW YORK BY THE SAME ROUTES

THROUGH BILLS OF LADING ISSUED, AND RATES QUOTED TO ALL POINTS, INSURANCE AT LOWEST RATES, SHIPMENTS TO OR FROM INTERIOR POINTS GIVEN THE MOST CAREFUL ATTENTION.

FOR RATES AND PARTICULARS APPLY TO

AMERICAN-ASIATIC S. S. CO.
10 AND 12 BROADWAY
NEW YORK

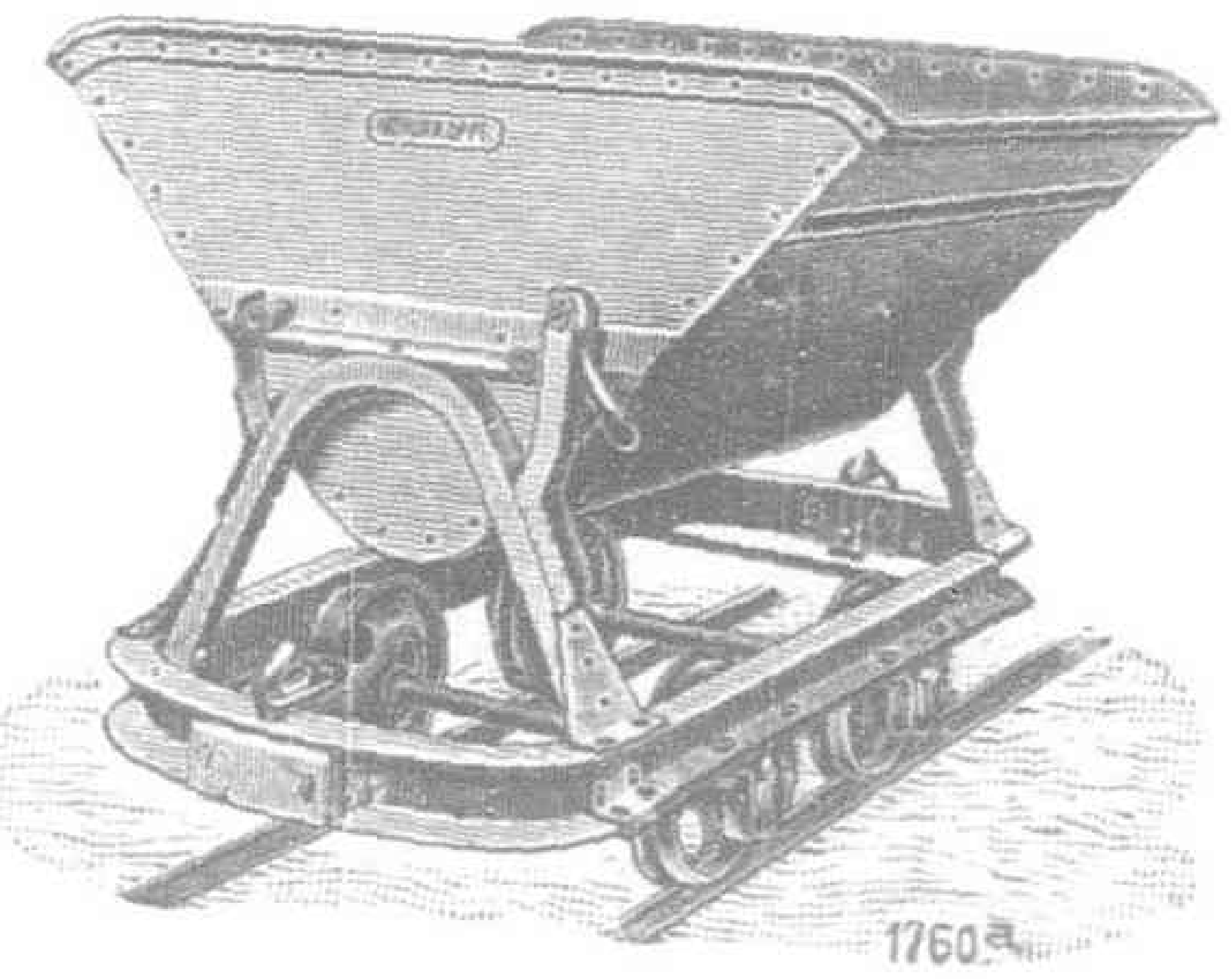
SHEWAN, TOMES & COMPANY
GENERAL AGENTS
HONGKONG

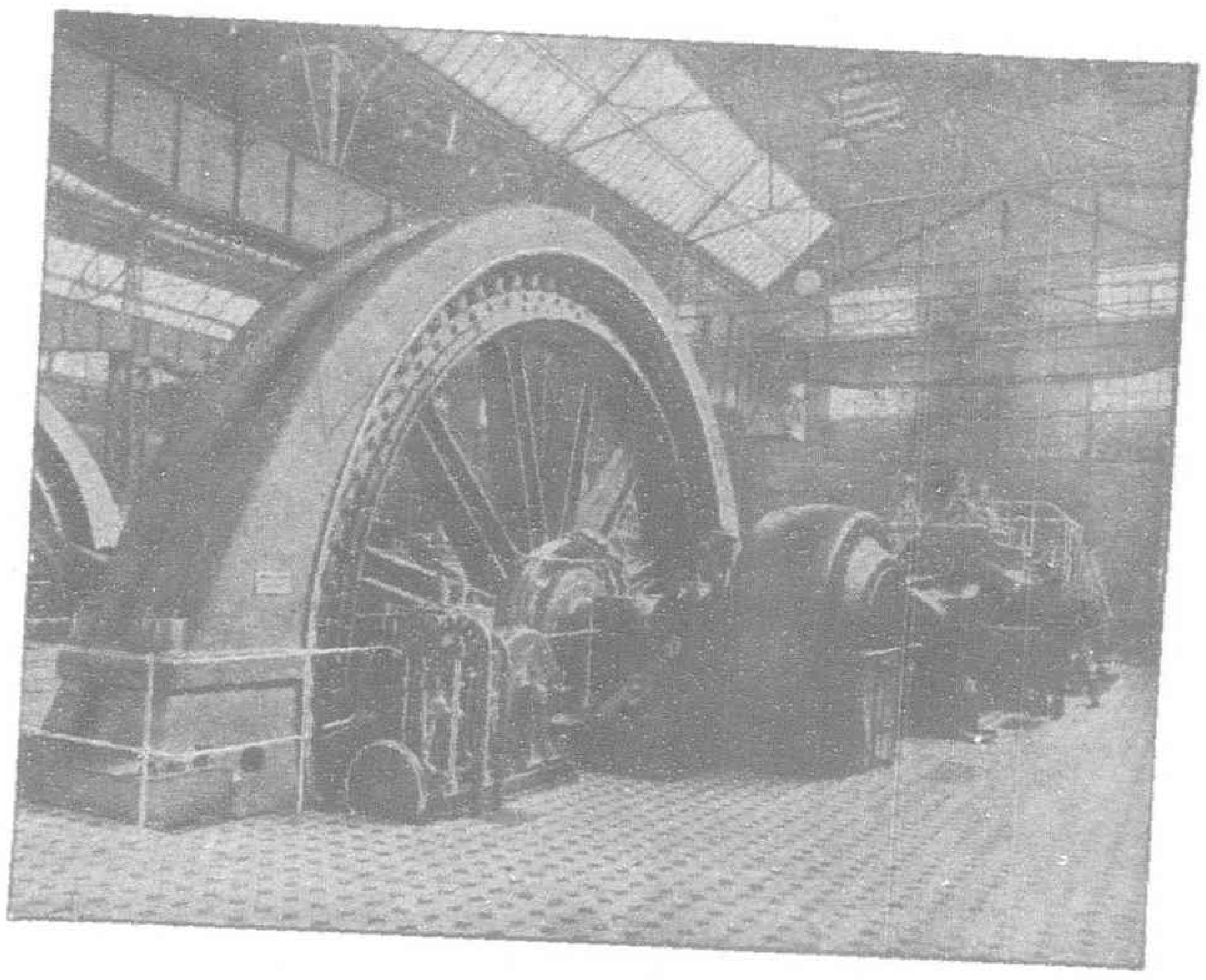
WARNER, BARNES & CO., LTD.
AGENTS
MANILA

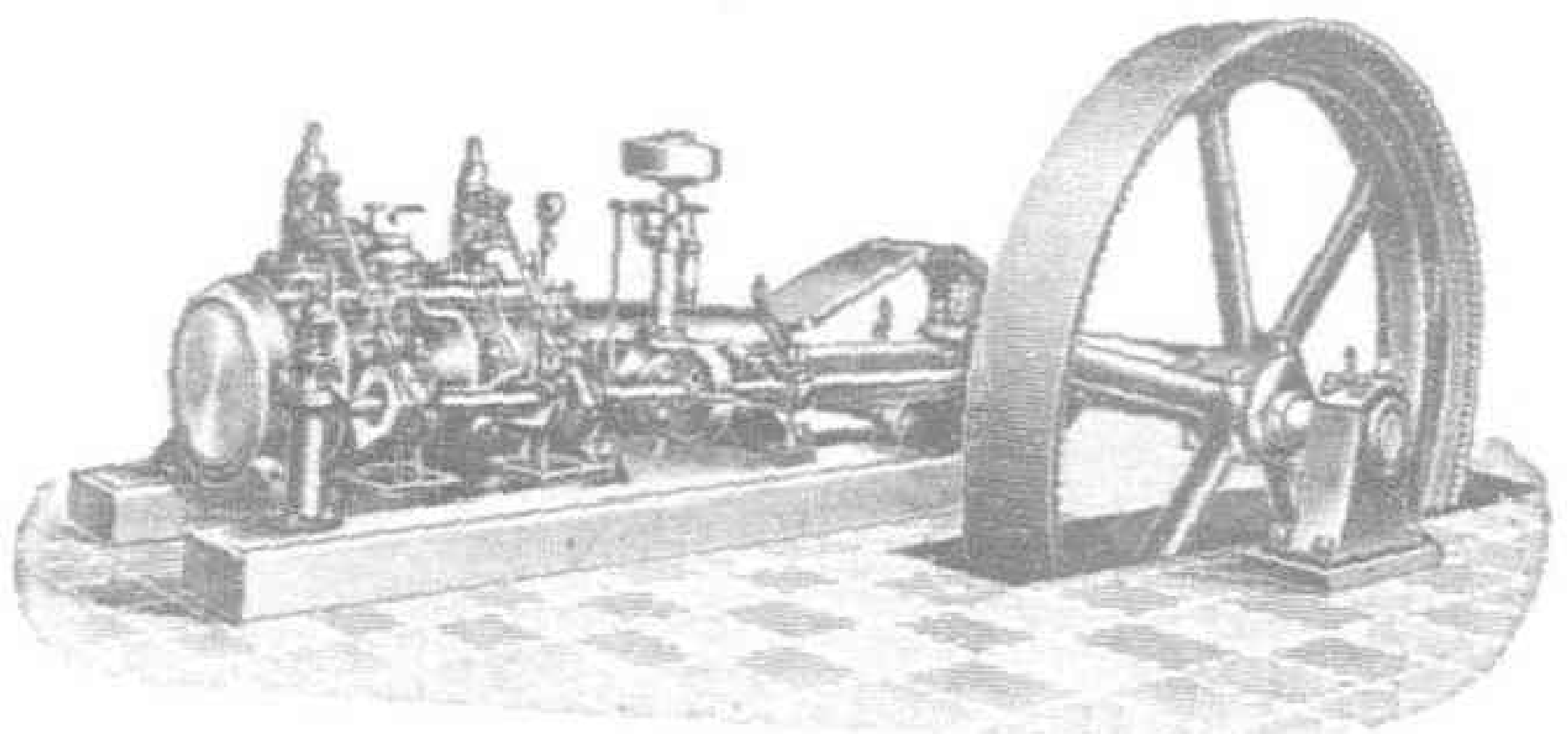
PRINT IN BINDING

Arnhold, Karberg & Co.

Shanghai, Hongkong, Canton, Hankow, Wuhu, Chungking, Tientsin, Tsingtau, Newchwang.







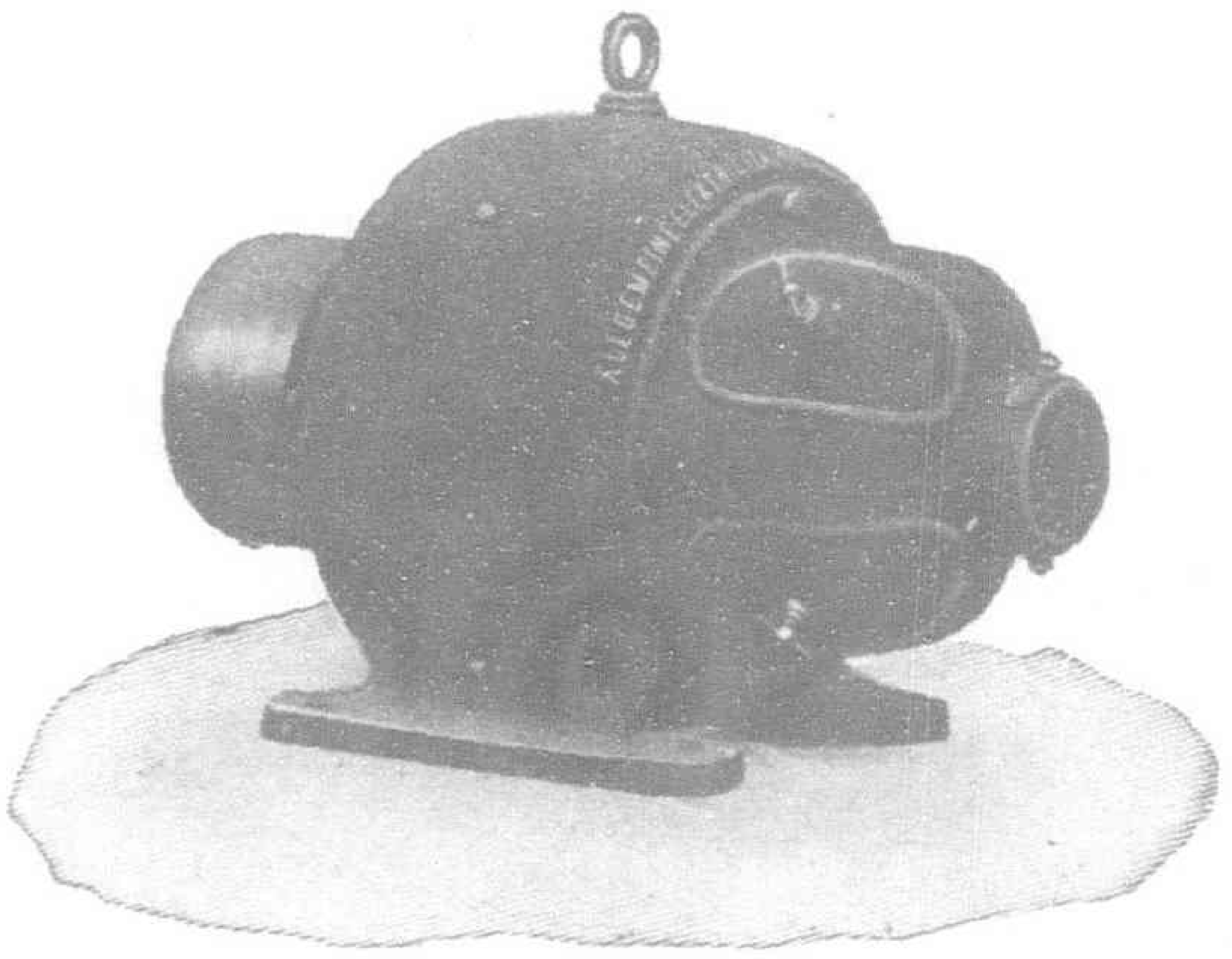
General Agents for

Allgemeine Elekricitaets Gesellschaft (A.E.G.) Berlin.

Wireless Telegraphy Co (System Telefunken)
Electric Train Lighting Co. Berlin.
Arthur Koppel Ltd. Berlin (Railway Material)
Berliner Maschinenbau A. G. vorm. Schwarzkopff (Motors, Torpedo and Mining Material, etc.)

A. Borsig, Tegel-Berlin (Engines, Pumps, Boilers, Ice Machines, etc.)
Deutsche Waffen and Munitions fabriken Karlsruhe (Arms, Mint Factories, etc.)
Waffenfabrik Mauser A. G. Oberndorf-Neckar Arms Works.

Skoda-Werke A. G. Pilsen
Arms Works, Material for Arsenals.



General Agents for

Ludw. Loewe A. G. Berlin (Machine Tools)

Stettiner Maschinenbau A. G. Vulcan (Marine Contractors)

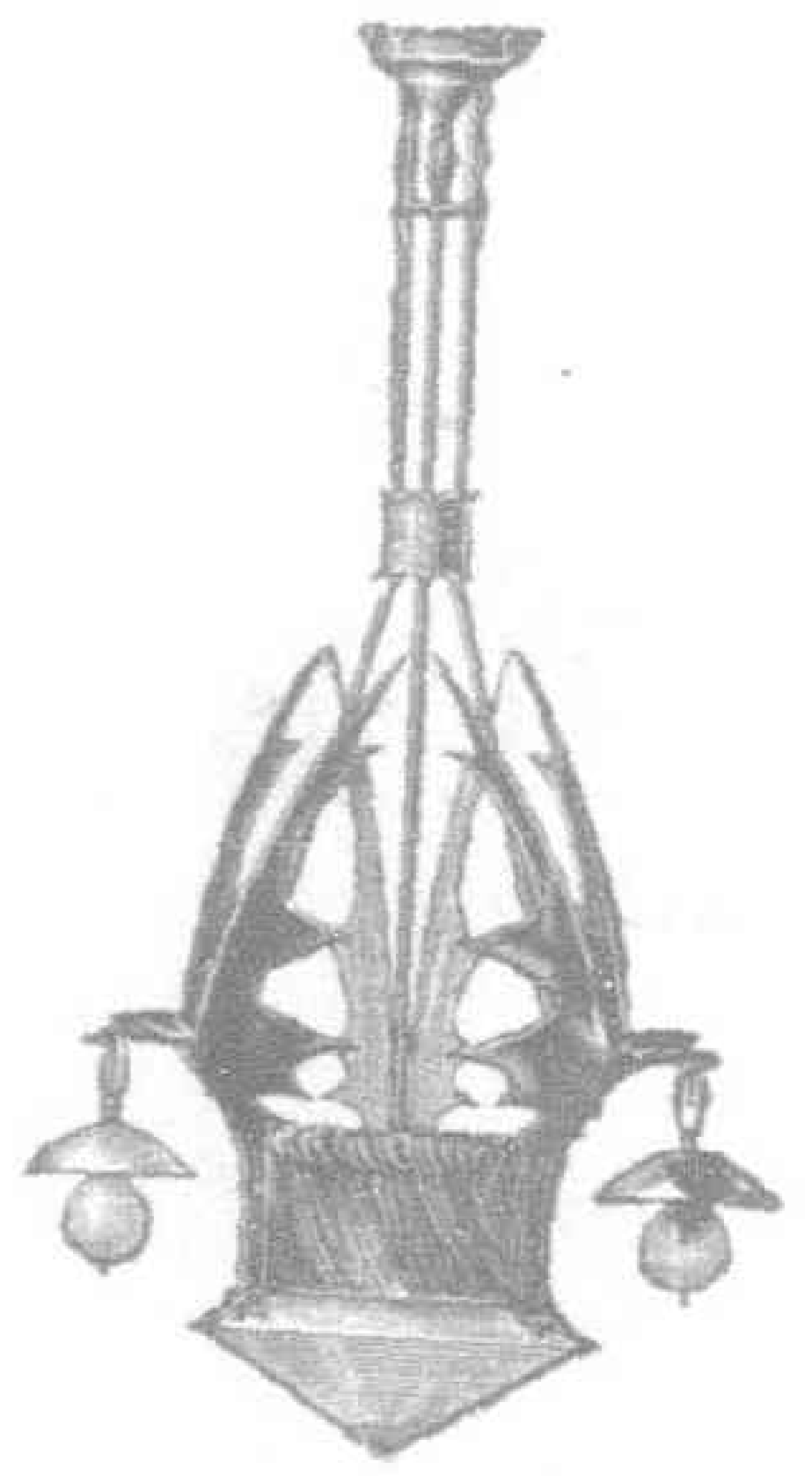
Jonas and Colver Ltd. Sheffield (Specialities for Arsenals)

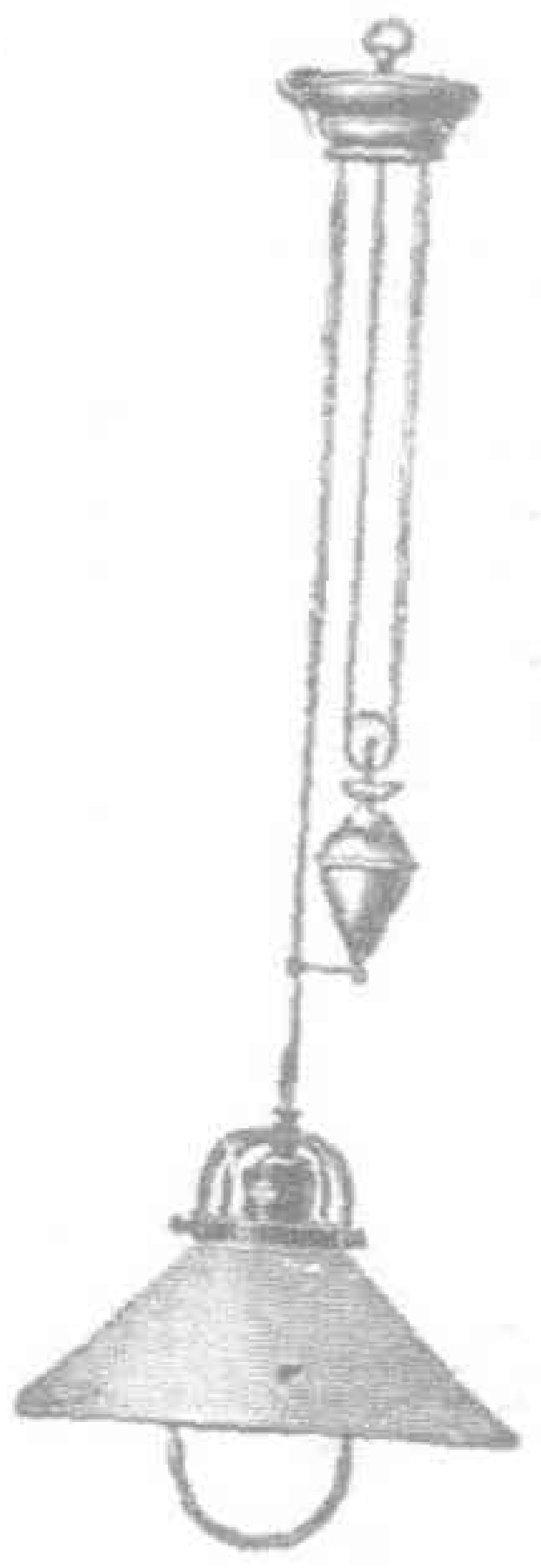
Asa Lees and Co., Ltd. Oldham (Equipments for Cotton Mills)

Carl Meissner Hamburg (Motor Boats)

Rendrock Powder Co. New York (Explosives, Racarock)

General Managers of the New Engineering and Shipbuilding Works Ltd. Shanghai.



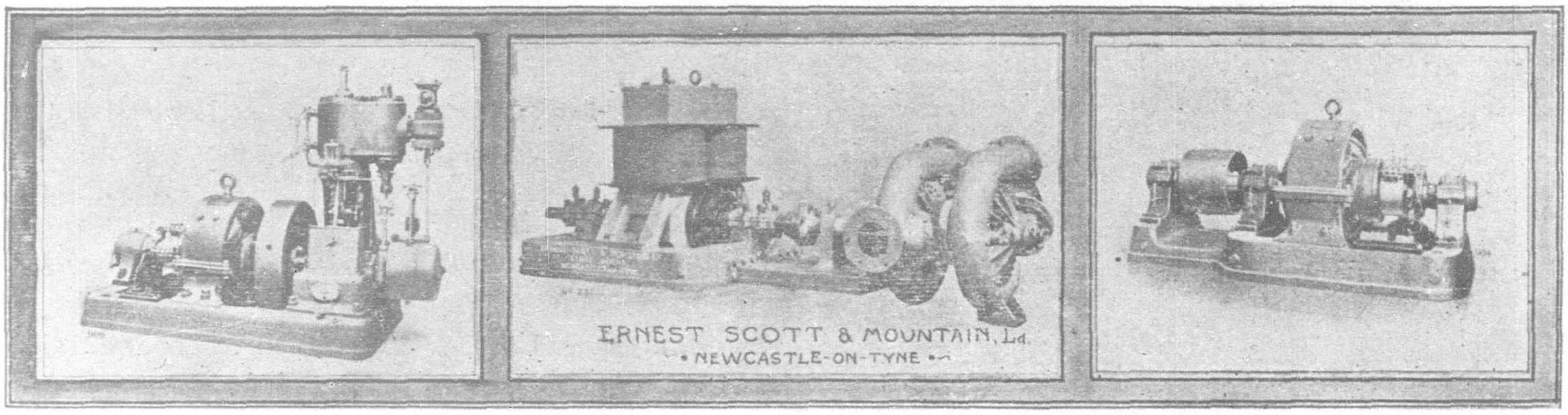


JARDINE, MATHESON & CO.

MACHINERY DEPARTMENT

PEKING ROAD, SHANGHAI

ENGINES, BOILERS, PUMPS AND ELECTRICAL MACHINERY FOR ALL PURPOSES
ENGINEERING AND ELECTRICAL SUPPLIES IN STOCK



SOLE AGENTS FOR:—John & Edward Wood. J. H. Gwynne & Co. Marshall, Sons & Co., Ltd. E. Scott & Mountain, Ltd. Merryweather & Sons, Ltd. The Campbell Gas Engine Co., Ltd. A. Ransome & Co., Ltd. J. Meridith, Jones & Sons. Kitson Light Foreign Supply Company.

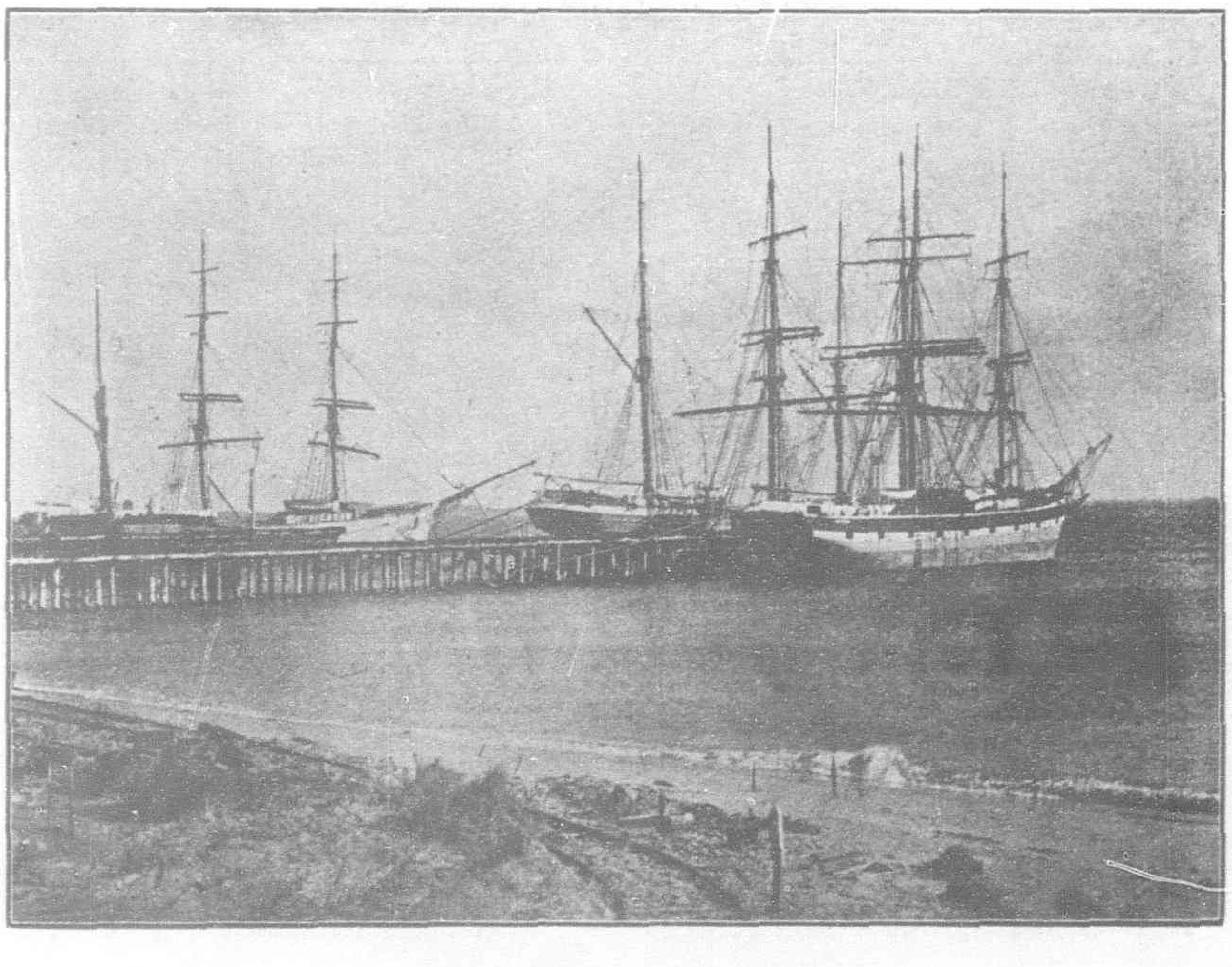
MILLAR'S KARRI AND JARRAH CO., LTD.

KARRI
AND
JARRAH

COMBINE GREAT STRENGTH WITH DURABILITY AND ARE IMPERVIOUS TO DESTRUCTIVE INSECTS AND DAMP

SPECIALLY ADAPTED FOR ALL KINDS OF ENGINEERING AND CONSTRUCTION WORK CABINET, ART WORK AND WOOD PAVING

LARGE STOCKS CARRIED RAILWAY SLEEPERS, PILES WHARF AND BRIDGE TIMBERS, TELEGRAPH POLES, FLOORING, PAVING BLOCKS, ETC.



COMPANY'S PRIVATE WHARF

EWO TIMBER DEPOT
SHANGHAI

KARRI, JARRAH
OREGON PINE
REDWOOD
BANGKOK TEAK
SINGAPORE
HARDWOODS

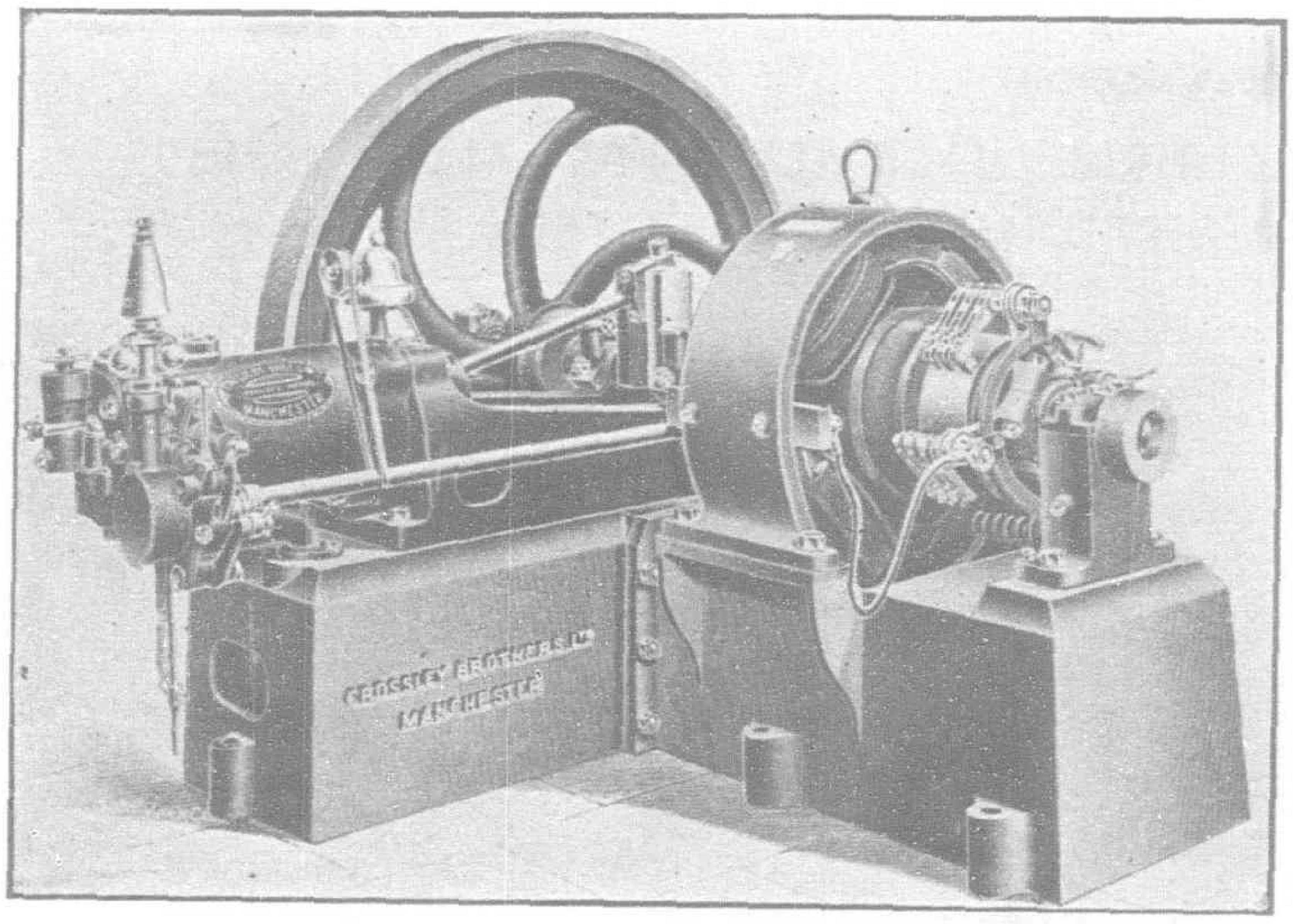
OPERATING OWN SAW MILL SUPPLYING ANY SIZES AND LENGTHS.

JARDINE, MATHESON & CO.

AGENTS

HONGKONG CHINA JAPAN

The Shanghai Gas Co., Ltd.



4 KILOWATT PLANT, DIRECT CONNECTED TO CROSSLEY ENGINE

WORKS: THIBET ROAD, SHANGHAI
SHOWROOMS: 31a NANKING ROAD, SHANGHAI

Sole Agents For
CROSSLEY'S GAS ENGINES
INDICATING ¾ TO 220 H. P.

MOST ECONOMICAL FOR ALL PURPOSES WHERE POWER IS REQUIRED.

CHAFF CUTTING, PUMPING, WOOD WORKING, PRINTING, HOISTING, PRESSING, WEAVING, SPINNING, MILLING, ETC.

ESPECIALLY ADAPTED FOR ISOLATED ELECTRIC LIGHTING PLANTS IN HOTELS AND PUBLIC BUILDINGS, ETC.

ESTIMATES AND SPECIFICATIONS FURNISHED ON REQUEST.

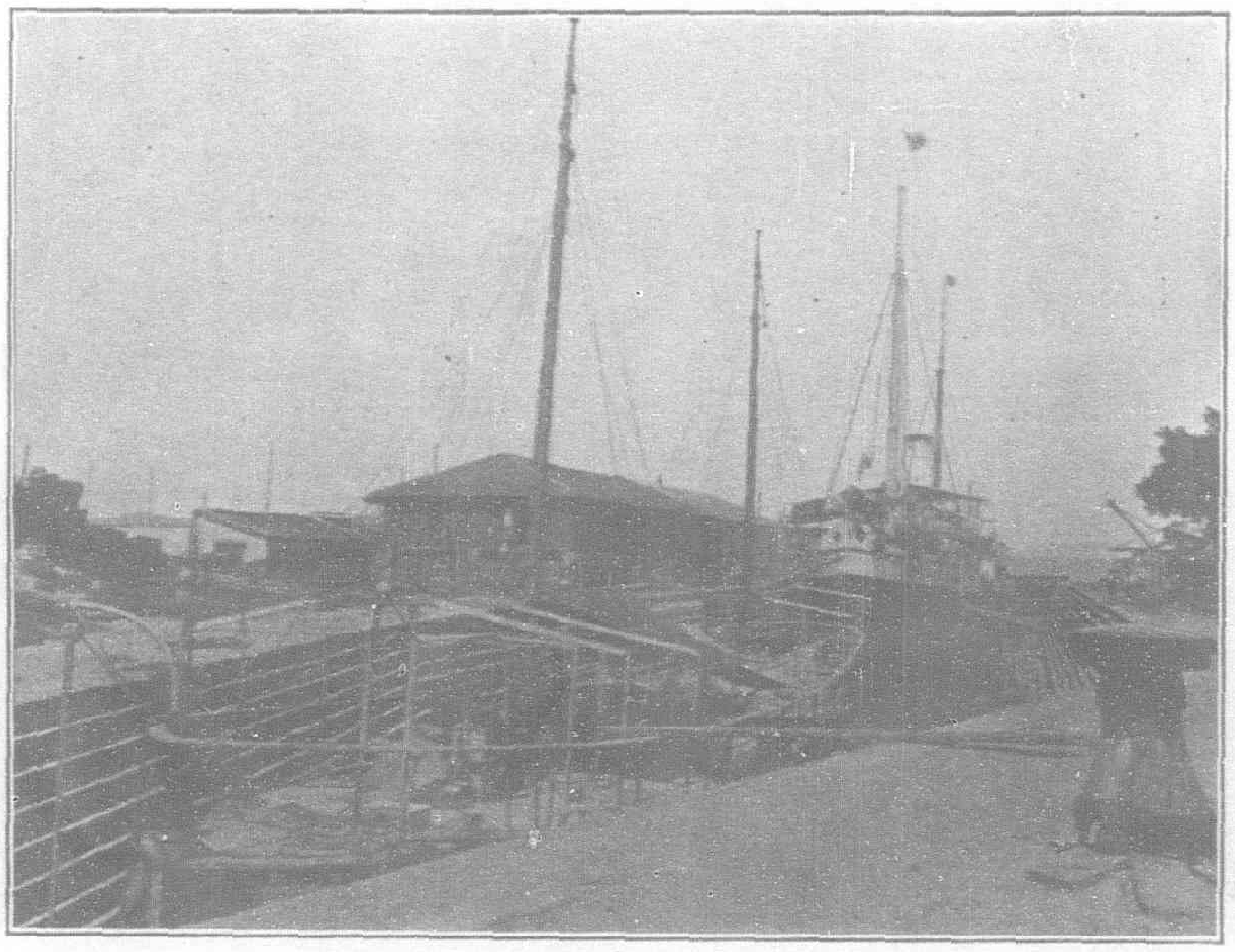
TELEGRAPH ADDRESS:
"DOCK"
AMOY, CHINA

THE NEW AMOY DOCK COMPANY, LIMITED
(ESTABLISHED IN 1892.)

CODES USED:
A. B. C., 5TH EDITION, AND
ENGINEERING TELEGRAPHIC
CODE AND SUPPLEMENT

OUR GRANITE DOCK IS A TIDAL SLIPWAY AND HAS AN EXTREME LENGTH OF 360 FT., WITH A LENGTH ON BLOCKS OF 340 FT. IT CAN RECEIVE VESSELS UP TO 330 FT. BETWEEN PERPENDICULARS, 40 FT. BEAM AND A MEAN DRAFT OF 16½ FT. DURING SPRING TIDE, AND 12 FT. DURING NEAPS : : : : : :

THE MOST CONVENIENT AND SATISFACTORY DOCK FOR PHILIPPINE SHIPOWNERS, ON ACCOUNT OF LOCATION AND DISTANCE : : : : : :



GRANITE DOCK

OUR SLIPWAY IS EQUIPPED WITH THE LATEST MODERN PLANT, AND CARRIES A LARGE STOCK OF MATERIAL FOR THE REPAIR OF SHIPS, ENGINES AND BOILERS : : : : :

ANOTHER SPLENDID SLIPWAY IS NOW UNDER CONSTRUCTION, WHICH WILL TAKE UP VESSELS OF FROM 250 TO 300 TONS : : : : : : :

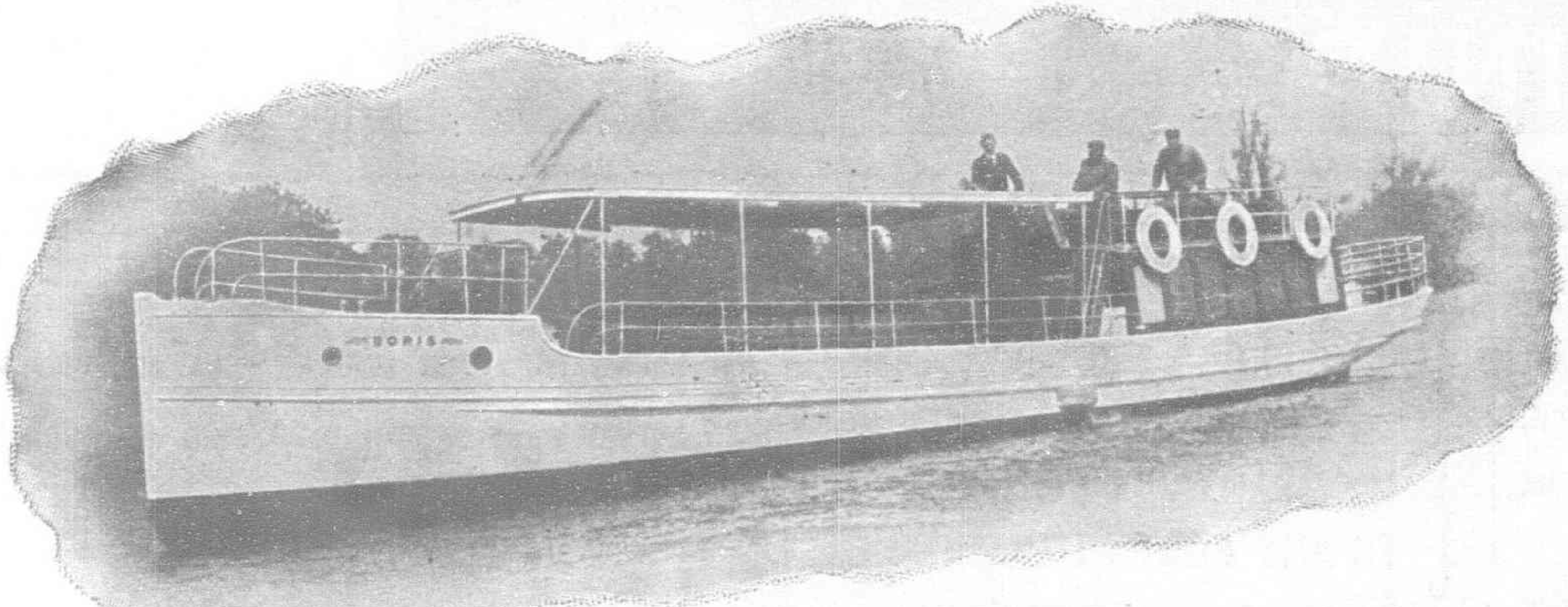
WRITE TO US FOR ESTIMATES

WE GUARANTEE ONLY HIGH GRADE WORK

The New Amoy Dock Company, Limited
AMOY, CHINA

Riley, Hargreaves & Company, Ltd.

SHIPBUILDERS AND STEEL CONSTRUCTIONAL ENGINEERS



60 FEET MOTOR PASSENGER BOAT

"Brooke"
Motor Boats

HIGH CLASS
RELIABLE
PRODUCTIONS

Write for Particulars

Sole Agents for J. W. Brooke & Co., Ltd., England

SINGAPORE

Cable Address:
"HARGREAVES SINGAPORE"

RICHARDSON, FINDLAY & CO.
Glasgow, Scotland.

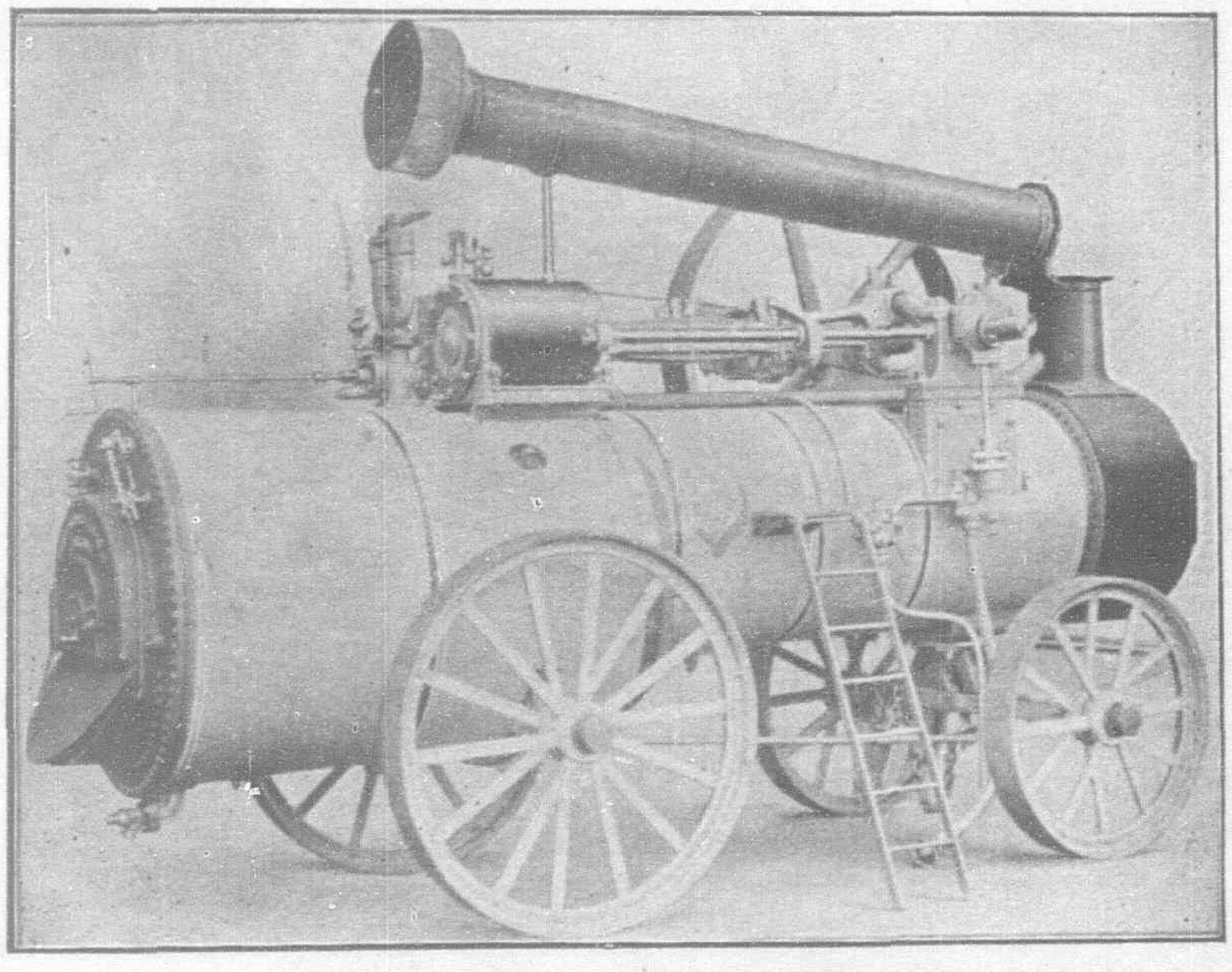
FINDLAY & CO.
MANILA, P. I.

FINDLAY, RICHARDSON & CO.
Kobe and Yokohama, Japan.

ENGINEERS AND CONTRACTORS —— IMPORTERS AND EXPORTERS

HARDWARE
MACHINERY
CEMENTS
AUSTRALIAN AND CALIFORNIA LUMBER

Agents for
THE NORTHERN ASSURANCE COMPANY
NORTHERN BRITISH AND MERCANTILE INS. CO.



"COLONIAL" PORTABLE ENGINE

MILNER'S SAFES
PERRY'S SAFES
FORCITE POWDER CO.'S EXPLOSIVES
WHITE BROS. CEMENT
ALSEN CEMENT

Agents for
THE PALATINE INSURANCE COMPANY, LIMITED
THE LONDON INSURANCE CORPORATION

Sole Agents for McONIE HARVEY & CO. High Class Sugar Machinery

HEAD OFFICES
IN CHINA:
MEADOWS ROAD,
TIENTSIN

CHINESE
ENGINEERING
AND
MINING Co. LTD.

TELEGRAPHIC ADDRESS
"MAISHAN"
CODES: A. I., A. B. C.
5TH EDITION

THE COMPANY OWNS
THE COAL MINES NOW BEING WORKED AT TONGSHAN AND LINSI IN THE CHIHLI PROVINCE, AND THE COAL FIELD IN WHICH THEY ARE SITUATED. THE QUALITY OF THE COAL IS SUPERIOR TO ANY NOW BEING MINED IN THE FAR EAST, AND IS SUITABLE FOR STEAMING AND ALL OTHER PURPOSES. THE COKE PRODUCED IS EQUAL TO THE BEST ENGLISH COKE AND COMMANDS A READY MARKET

OUTPUT AND SALES
1,000,000 TONS PER ANNUM
CARGOES DELIVERED BY
COMPANY'S OWN STEAMERS
TO ANY PORT IN THE FAR EAST

THE COMPANY HAS
FACILITIES FOR LOADING COAL AT THE ICE FREE PORT OF CHIN-WANG-TAO, WITH WHICH IT IS IN RAILWAY COMMUNICATION

THE IMPERIAL RAILWAYS OF
NORTH CHINA AND THE LUHAN RAILWAY USE THIS COAL FOR THEIR LOCOMOTIVES, AND AN EXTENSIVE BUNKERING BUSINESS IS DONE WITH STEAMERS

COAL
TONG SHAN
CEMENT

TONGSHAN
PORTLAND
CEMENT
IS MANUFACTURED FROM THE BEST RAW MATERIALS BY COMPLETE AND MODERN MACHINERY UNDER EXPERT SUPERVISION. UNIVERSALLY USED THROUGHOUT NORTH CHINA AND HAS SECURED THE HIGHEST APPROVAL FOR ITS GOOD QUALITY, CONSTANCY OF VOLUME AND FINENESS : :

TONGSHAN
PORTLAND
CEMENT
WAS AWARDED A SILVER MEDAL AT ST. LOUIS EXPOSITION, DECEMBER, 1904 : :

MOSAIC FLOORING TILES
Equal in quality and finish to best European Make, Large Variety of Artistic Designs for Center and Border Tiles to *meet any requirement.*

FIREBRICKS
The excellent seams of fireclay in the neighborhood of Tongshan enables us to place in the Chinese market a very superior firebrick at about one fourth the cost of the imported article. Output 50,000 bricks per day. Arch and cupola bricks, boiler seating blocks, and special shapes, made to order.

FIRECLAY FLOORING TILES
For Kitchens, Verandas, Public Buildings, etc., etc., etc.,
MADE OF FIRE CLAY IN ATTRACTIVE DESIGNS

SHANGHAI BRANCH OFFICE, N° 1 JINKEE ROAD

CHEFOO: CARLOWITZ & CO.
WEI-HAI-WEI: LAVERS & CLARK
TSINGTAU: GEBRUDER LAENGNER
HONGKONG: SHEWAN, TOMES & CO.
HANKOW: BELGIAN TRADING CO.
NEWCHWANG: BUSH BROS.
PEKING: J. REDELSPERGER.

TELEPHONES:

856	President's and Vice-President's Office. (Long Distance.)
151	Secretary's Office.
24	Engineering Department.
633	Shipbuilding Department.
737	Store Department. (Long Distance.)

Cable Address:
"DOCKYARD"
AI, A B C, Scott, Western Union
Engineering Codes Used

KAWASAKI DOCKYARD CO., LTD.

KOBE, JAPAN

CONTRACTORS TO THE IMPERIAL JAPANESE ARMY, NAVY AND FOREIGN GOVERNMENTS

POWERFUL SALVAGE AND TOWING BOATS AVAILABLE AT SHORTEST NOTICE

SHIPBUILDERS, ENGINEERS, BOILERMAKERS

MANUFACTURERS OF CAST STEEL RUDDERS, STERN FRAMES, PROPELLER BLADES, BRACKETS AND STEMS, STEEL GEARING, PISTONS, CYLINDERS AND ENGINE CASTINGS

ALL WORK GUARANTEED TO BE OF THE HIGHEST ORDER AND TO CONTAIN ALL THE MOST UP-TO-DATE IMPROVEMENTS

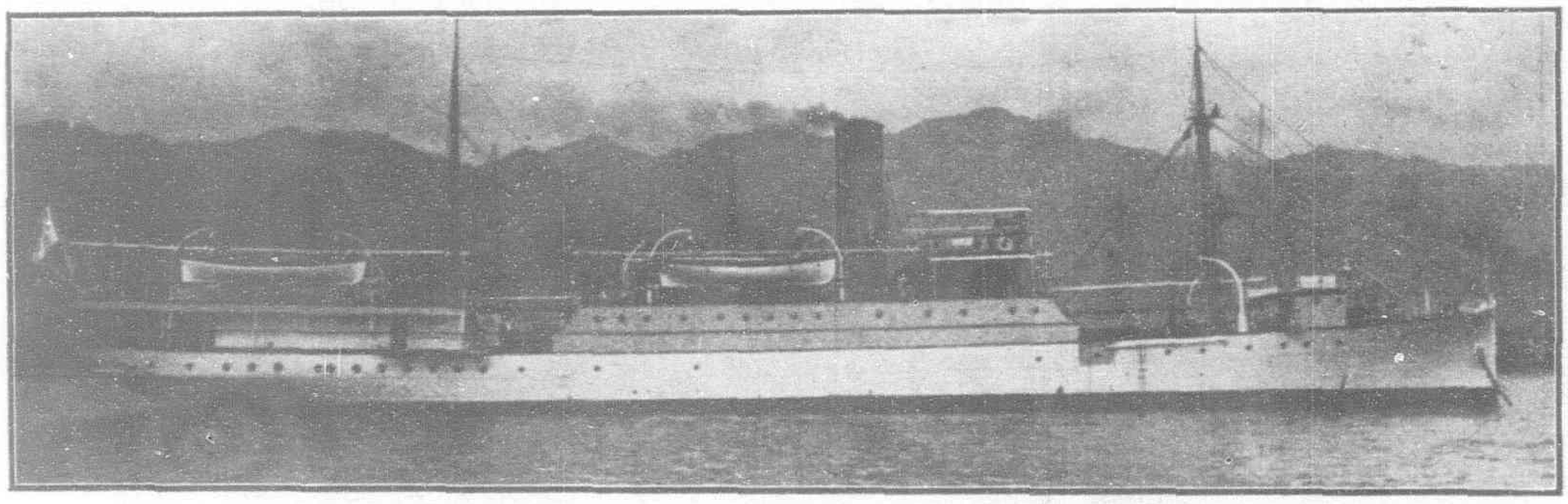
PARTICULARS OF *DOCK AND SLIPS*

No. 1 Graving Dock,

Length	425 ft. 6 in.
Width of entrance on top	63 ft. 6 in.
Width of entrance on bottom	51 ft. 7 in.
Depth over sill	23 ft. 7 in.

No. 2 Patent Slip,

Length	180 ft. 0 in.



LIGHTHOUSE TENDER "KWANGCHEI," BUILT FOR THE IMPERIAL COREAN MARITIME CUSTOMS, 1904, BY THE KAWASAKI DOCKYARD CO., LTD.

K. Matsukata,	*President*
Y Kawasaki,	*Vice-President*
M. Yotsumoto,	*Secretary*
H. Kumata,	*Accountant*
F. T. Sumura,	*Superintendent*
T. Saka, Dr.,	*Chief Engineer*
T. Tanaka,	*Chief Constructor*
G. Matsukata,	*Chief Storekeeper*

The Dockyard extends along almost the whole length of the shore of the Western Harbor and is in close proximity to Shipping Berths.

EL VARADERO DE MANILA

(INCORPORATED)—Established in 1884

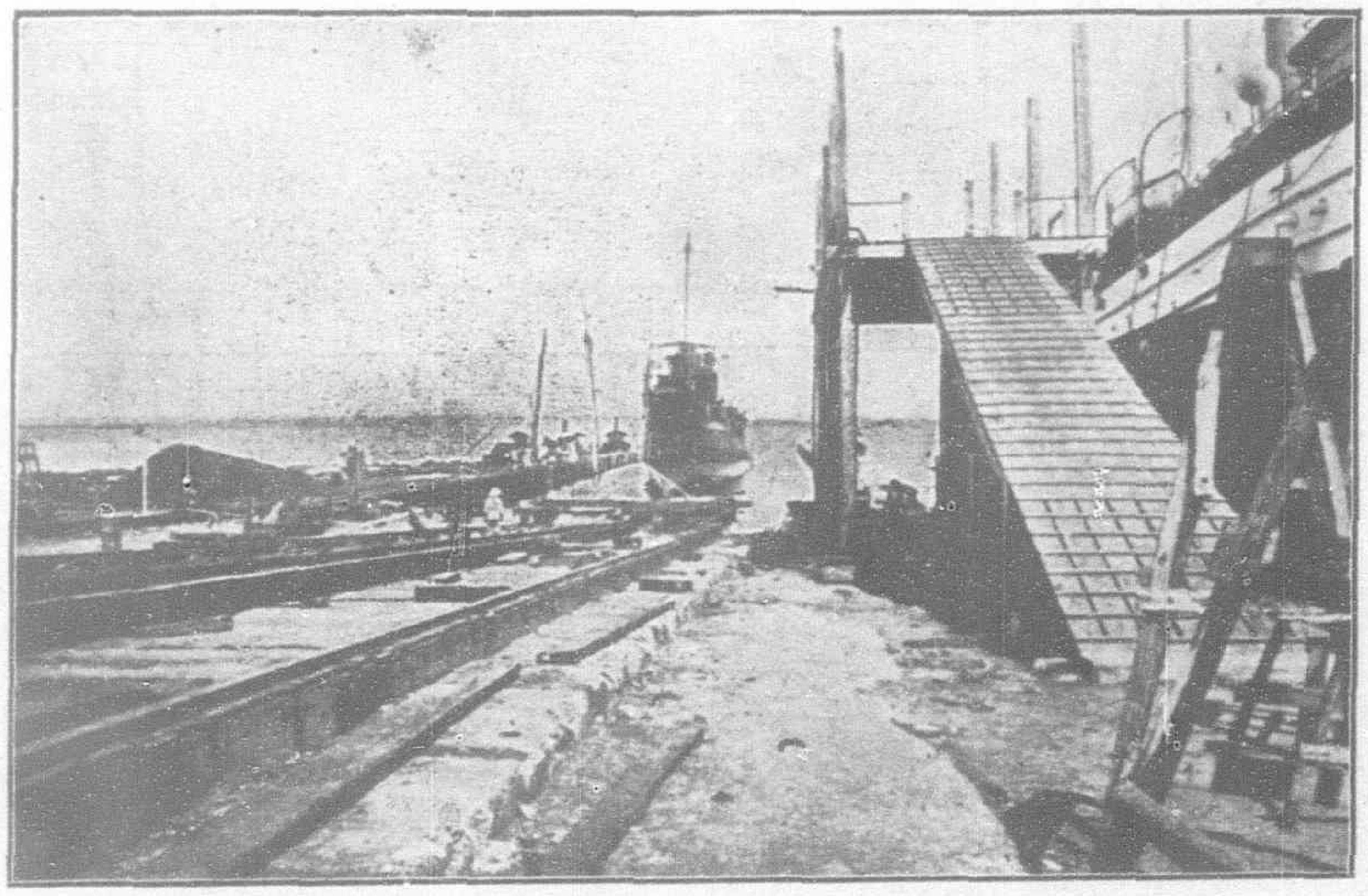
Cable Address
R. REYES
Manila

P. O. Box 202

HEAD OFFICE
Manila, P. I.

RAFAEL REYES
General Manager

Our Slipway is equipped with an up-to-date plant, and carries a large stock of material for the repair of ships, engines and boilers.



SLIP No. 1. Length 320 feet capacity 2400 gross tons
SLIP No. 2. " 210 feet capacity 1200 gross tons

Codes Used
A B C, 4th Edition
WESTERN UNION
and A I

SLIPWAY and DOCKS

Located at the sheltered harbor of

CANACAO
CAVITE, P. I.

Director of Works,
MR. A. YOUNG

THE MANILA SLIP COMPANY

MANILA, P. I.

LA YEBANA Cigar and Cigarette Factory

HIGH GRADE
MANILA CIGARS

The only Manila Cigars which may be compared with Havana Cigars as to quality and workmanship.
The leaf is obtained from our OWN PLANTATIONS situated in Isabela Province where the CHOICEST TOBACCO is grown. These plantations cover about 8000 acres and comprise the estates of Maluno, Yeban, Lucban and Ballao.

WRITE FOR
PRICE LIST

MEANS
Highest Quality,
Finest Workmanship,
And
An ideal smoke

Gold medal
St. Louis 1904

Two gold medals
Portland (Ore) 1905

PROPRIETORS:

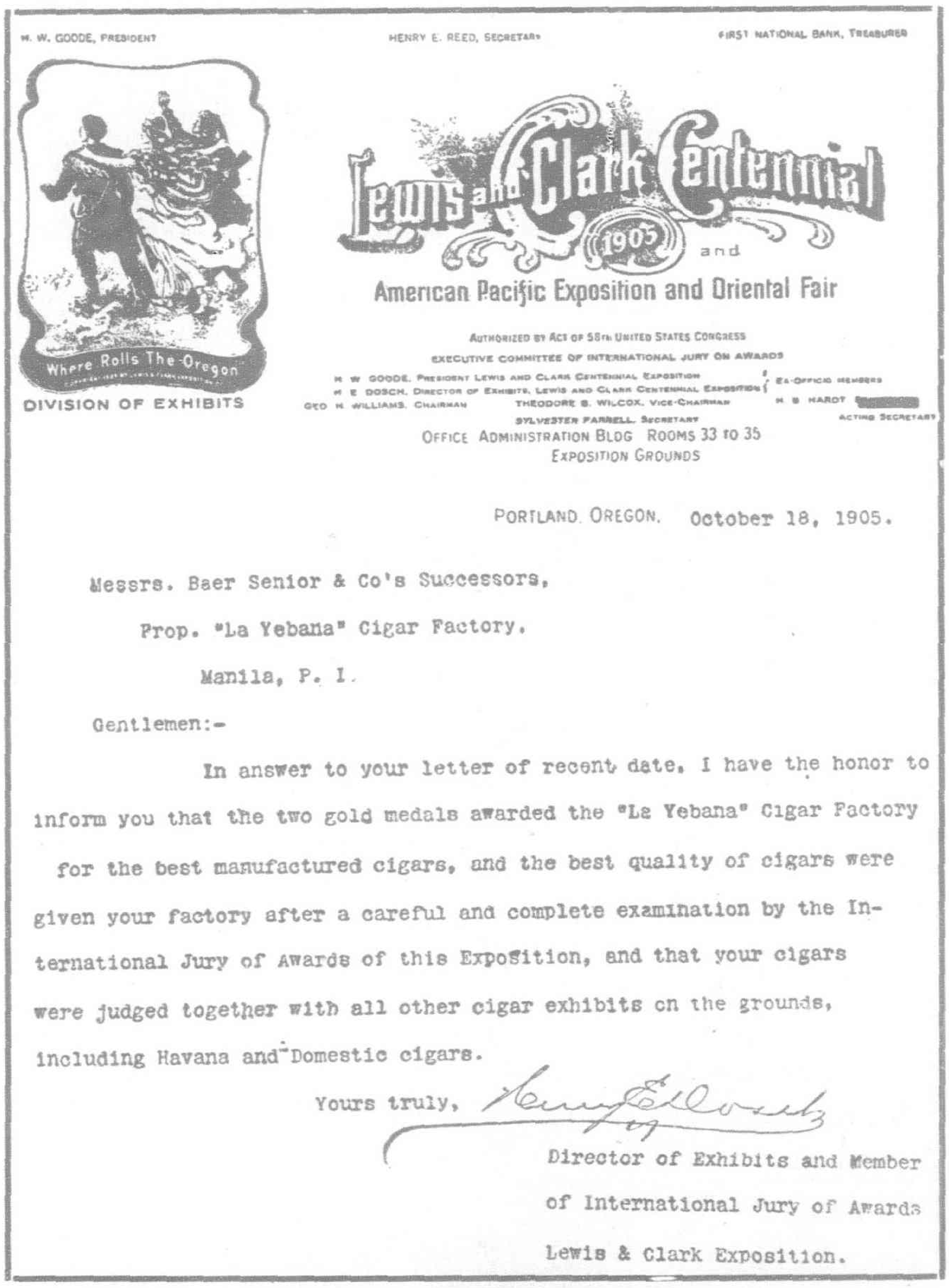
Baer Senior & Co.'s Successors

Tobacco growers, dealers and manufacturers
Distillers of Essence of Ylang-Ylang
and other essential oils

AGENTS:

Austrian Lloyds S. S. Co., Trieste, and the
Nord-Deutsche Insurance Company,
Hamburg

MANILA, P. I. **Cable Address:**
P. O. Box 442 **"PROTECTION"**



H. W. GOODE, PRESIDENT HENRY E. REED, SECRETARY FIRST NATIONAL BANK, TREASURER

Where Rolls The Oregon
DIVISION OF EXHIBITS

Lewis and Clark Centennial
1905
and
American Pacific Exposition and Oriental Fair

AUTHORIZED BY ACT OF 58TH UNITED STATES CONGRESS
EXECUTIVE COMMITTEE OF INTERNATIONAL JURY ON AWARDS
H W GOODE, PRESIDENT LEWIS AND CLARK CENTENNIAL EXPOSITION
H E DOSCH, DIRECTOR OF EXHIBITS, LEWIS AND CLARK CENTENNIAL EXPOSITION } EX-OFFICIO MEMBERS
GEO H. WILLIAMS, CHAIRMAN THEODORE B. WILCOX, VICE-CHAIRMAN H B HARDT [redacted]
SYLVESTER FARRELL, SECRETARY ACTING SECRETARY
OFFICE ADMINISTRATION BLDG ROOMS 33 TO 35
EXPOSITION GROUNDS

PORTLAND, OREGON. October 18, 1905.

Messrs. Baer Senior & Co's Successors,
Prop. "La Yebana" Cigar Factory,
Manila, P. I.

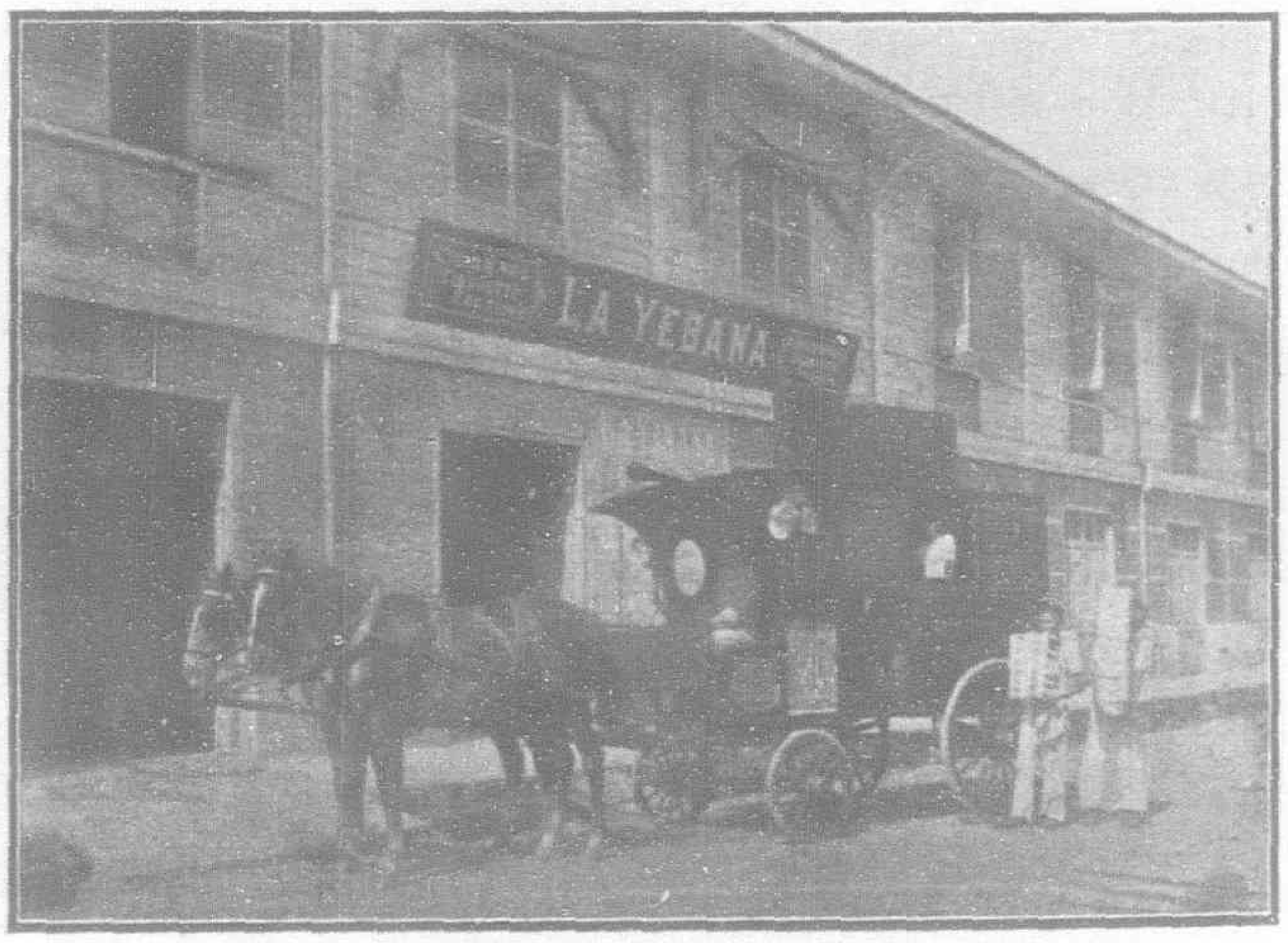
Gentlemen:-

In answer to your letter of recent date, I have the honor to inform you that the two gold medals awarded the "La Yebana" Cigar Factory for the best manufactured cigars, and the best quality of cigars were given your factory after a careful and complete examination by the International Jury of Awards of this Exposition, and that your cigars were judged together with all other cigar exhibits on the grounds, including Havana and Domestic cigars.

Yours truly, Henry E Dosch

Director of Exhibits and Member
of International Jury of Awards
Lewis & Clark Exposition.

TOBACCO FIELD ON STATE OF MALUNO



EXTERIOR VIEW OF FACTORY

The Oriental Construction Co., Ltd.

BOARD OF DIRECTORS

C. W. MEAD, C. E.
General Manager

N. M. HOLMES, C. E.
CHAN A. FOOK

Cable Address:
"Werrick"

Codes Used:
A. B. C., 5th Edition, and
Western Union

Consulting and Supervising Engineers and Contractors

This Company is Prepared to Undertake All Kinds of Construction Work, Particularly in the Line of Railway, Hydraulic, Mining and Sanitary Engineering.

We will Make Complete Surveys, Reports and Estimates on any Railway Proposition, or will Contract to Construct the Same in Section or in Whole.

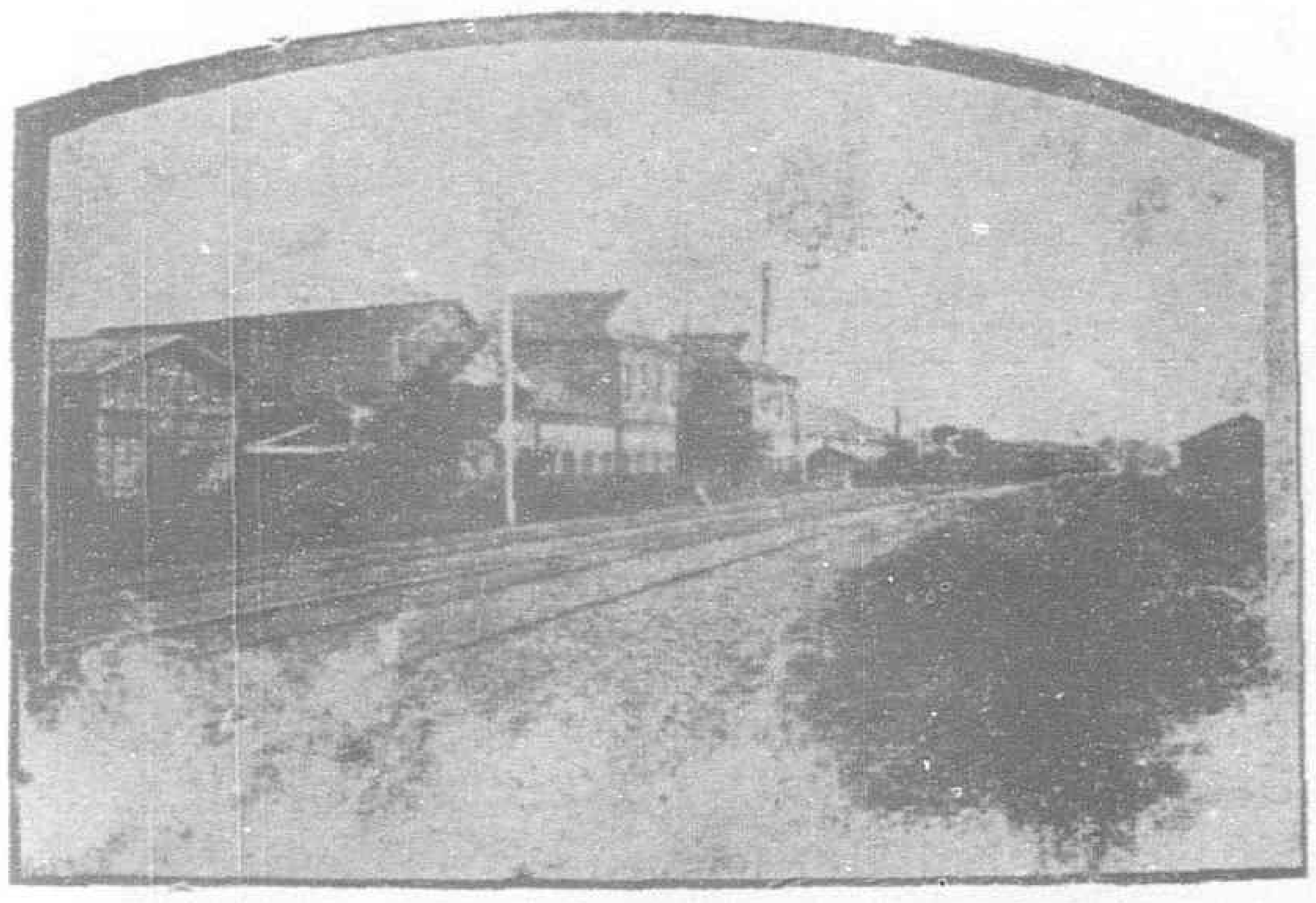
We will Examine and Report Upon Mines or Any Proposed Construction Work.

Our System of Reinforced Concrete and Concrete Piles Should Be Consulted By Those Contemplating the Erection of Any Kind of Structure.

SHANGHAI OFFICE:
KALEE

MANILA OFFICE:
5 Isla de Romero

HONGKONG OFFICE:
PRINCE BLDG.



Shibaura Engineering Works, Tokio, Japan

Shibaura Engineering Works

ENGINEERS, FOUNDERS AND MACHINISTS
Builders of ELECTRICAL AND MECHANICAL APPARATUS
THE MIYABARA WATER TUBE BOILER

TOKIO JAPAN

Cable: "SHIBAURA" Tokio

P. O. BOX 598. H. THURBER, MANAGER.

MANILA CONSTRUCTION CO.

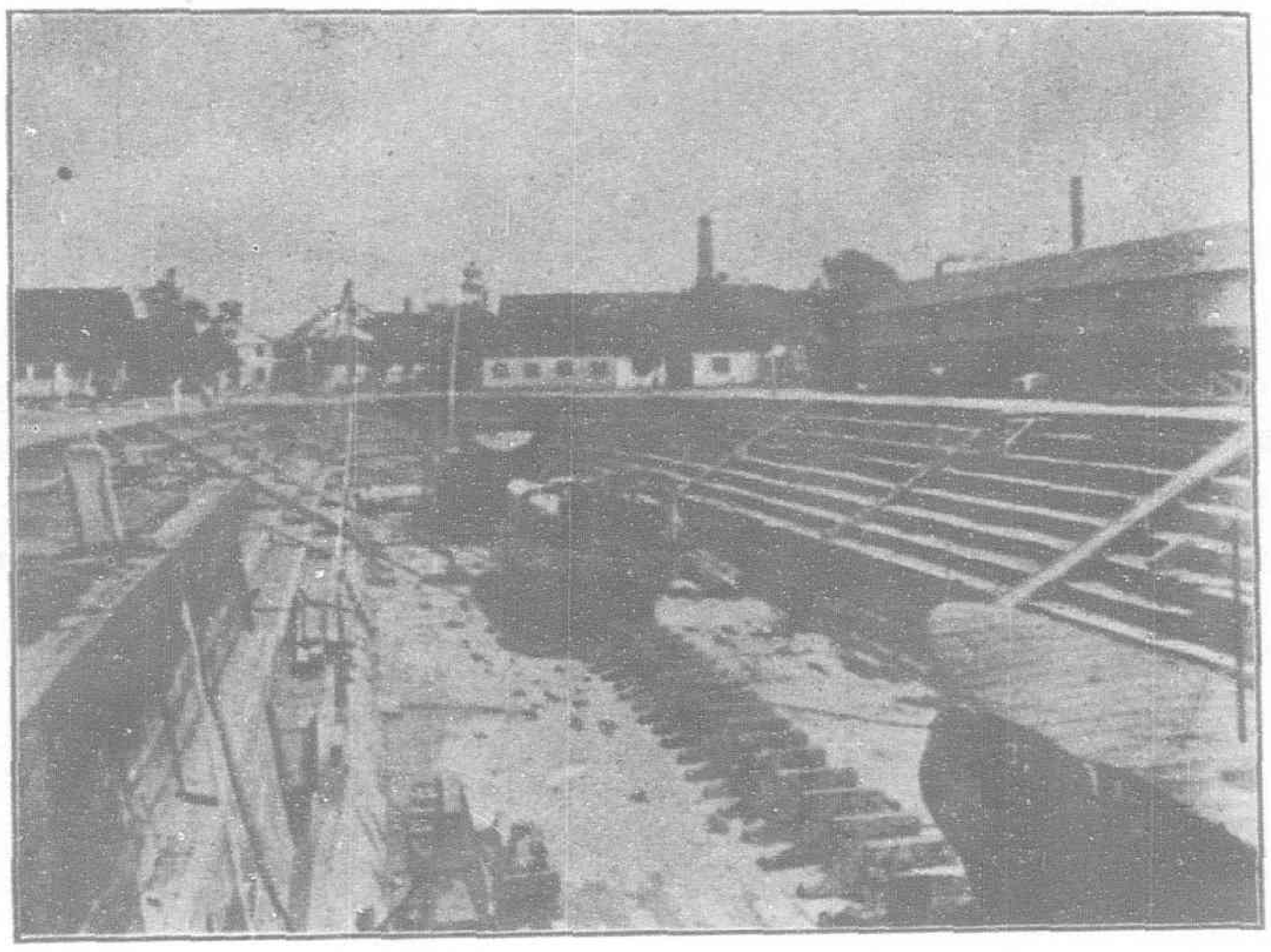
CONTRACTORS AND BUILDERS

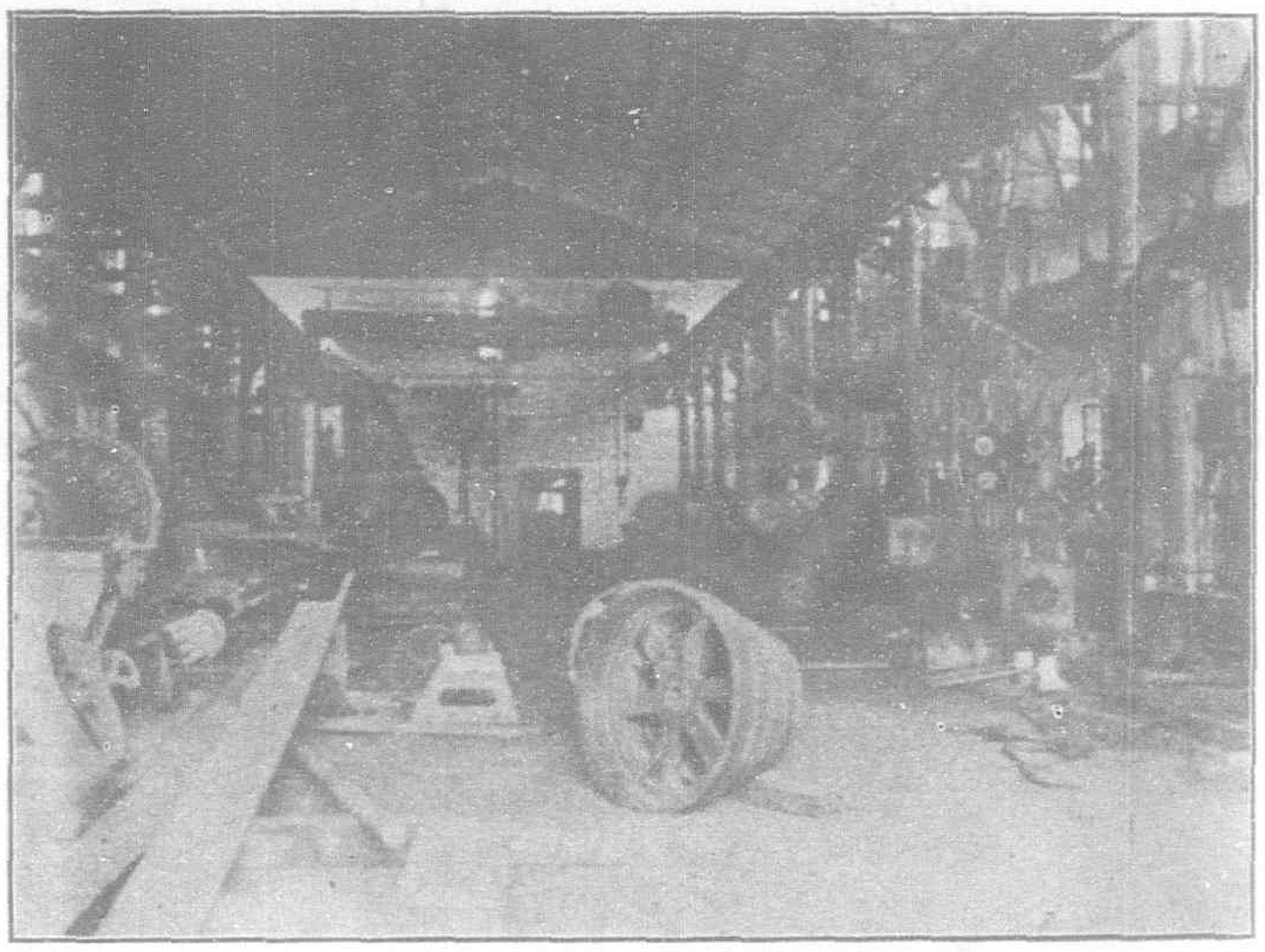
Contracts accepted for the Construction of Buildings, Cottages, Bridges, etc., etc.

Plans and Estimates Furnished on Application. We are Prepared to Handle Provincial Contracts.

9 PLAZA MORAGA MANILA, P. I.

KIANGNAN
DOCK AND ENGINEERING
WORKS





KIANGNAN DOCK—Length over all, 385′; length on blocks, 375′; water on sill, 19′; dock entrance, top, 70′, bottom, 60′.

The dock accommodates the largest coasting steamers and is equipped with complete modern facilities for handling work thoroughly and promptly.

The new machine and boiler shops, and the foundry and shipbuilding plant are equal any this side of Suez.

Patent slipway for small steamers and launches. Complete boat and launch building shops.

CONTRACTORS FOR REPAIRING, DOCKING AND REFITTING THE VESSELS OF THE IMPERIAL CHINESE NAVY AND THE IMPERIAL MARITIME CUSTOMS

DIRECTORS:
ADMIRAL SAH,
CAPTAIN WOO,
Imperial Chinese Navy

MANAGERS:
L. BASSE
R. B. MAUCHAN

**SHIPBUILDERS, ENGINEERS,
BOILERMAKERS AND DOCK OWNERS**

SHANGHAI

CABLE ADDRESS:
"SINODOCK"

CODES:
A. B. C. 5th Edition,
ENGINEERING,
LIEBER'S,
STANDARD

LOUIS T. GRANT,
GENNERAL MANAGER

CABLE ADDRESS, "LOUISGRAN" MANILA
WESTERN UNION AND A B C CODES

GRANT & CO., LTD.,

CONSULTING AND CONTRACTING ENGINEERS

SOLE AGENTS IN THE PHILIPPINE ISLANDS FOR THE GENERAL ELECTRIC CO.,
SCHENECTADY, N. Y.

Electric Railway, Light, and Power Plants. Steam and Hydraulic Installations. Isolated Lighting Plants a Specialty. Motors, Telephones, and Wiring. A Full Line of Fans and Electric Light and House Fixtures on Hand. Estimates Furnished.

P. O. BOX
759.

OFFICE AND STORE:
68 DULUMBAYAN.
MANILA, P. I.

Easy To Put On

Whether you are putting a roof on a new building or a new roof on an old building—the roof that will give the best service for every dollar of cost—is the cheapest.

Pioneer

Rubber
Sanded
Roofing

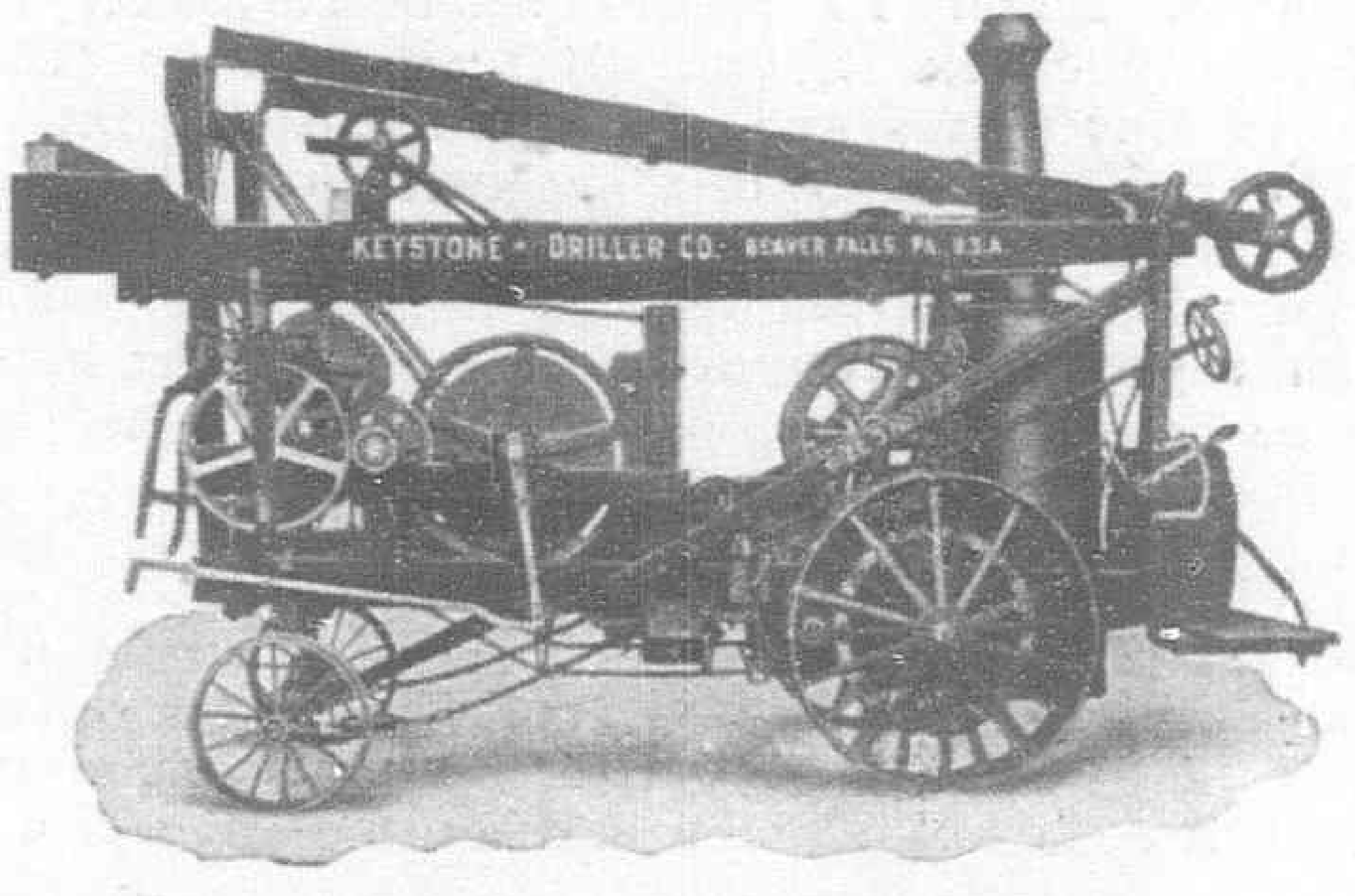
Is the best roofing made for any building. The wearproof surface of Hard Flint Sands adds many years of wear. It requires no painting or coating at any time. It is not affected in any way by sun or rain. It keeps the building cool and dry, because it is a non-conductor. Our representative,

Mr. H. W. Robbins

Is now travelling through the Orient. He would be glad to call and talk it over with you. Address him, care of this paper. AGENTS WANTED EVERYWHERE.

PIONEER ROLL PAPER CO., Los Angeles, Cal., U. S. A.

We Make
The Standard
KEYSTONE
Line of


KEYSTONE DRILLER CO. BEAVER FALLS, PA. U.S.A.

PORTABLE WELL DRILLING MACHINERY

Water Well Drillers, Traction and Non-traction, for all depths up to 1000 feet—Catalog No. 1.
Mineral Prospecting & Placer Gold Testing Machines and Equipments—Catalog No. 2.
Percussion Core Drilling Attachments, for Coal Testing—Catalog No. 2 B.
Portable Oil Well Rigs, for depths of 1000 to 2500 feet—Boiler on separate truck—Catalog No. 3.
Contractor's Blast Hole Drillers for work in heavy R. R. Cuts.
Canal Excavation, River and Harbor Exploration, Etc.—Catalog No. 4.
(Any or all of these Catalogs free on request)

AGENTS WANTED.

We desire to place two or three agencies in the Far East, with reputable Machinery Dealers.

KEYSTONE DRILLER CO.
BEAVER FALLS, PA., U. S. A.

CABLE ADDRESS: "DRILLER"
CODES:—LIEBER'S, WESTERN UNION, AND A. B. C. 4TH AND 5TH EDITIONS

POSTAL ADDRESS:
41 URBIZTONDO

CODES USED:—
A1., A. B. C. (5TH ED.)
LIEBER'S AND ENGINEERING.

FRED WILSON & CO.

ENGINEERS

SOLE AGENTS IN THE PHILIPPINE ISLANDS FOR

MARSHALL SONS & CO., Makers of High Class Steam Engines and Boilers, Gold Dredgers, Thrashing Machinery
JOHN McNEIL & CO., Manufacturers of Rice and Sugar Milling Machinery of the Highest Grade
THE LIDGERWOOD MANUFACTURING CO., Pile Drivers and Hoisting Engines

THE ENGLEBERG HULLER CO., Rice Milling, etc.
JOHN B. ADT, Tobacco Machinery
THE BONSACK PATENT Cigarette Machine
GEO. PRICE, Bankers' Engineer, Fire Proof Safes, etc.

ESTIMATES ON APPLICATION

MANILA, P. I.

TELEGRAPH ADDRESS:
"Carmichael, Hongkong"

—CODES:—
A. B. C., 4th and 5th Editions; Watkins'; A 1; and Lieber's Standard

CARMICHAEL & CLARKE

3 Queen's Building, Hongkong

CONSULTING ENGINEERS, SHIPBUILDERS AND CONTRACTORS

Agents for "SMOOTH-ON" BOILER CEMENT

For leaky boilers "Smooth-On" is indispensable. It saves boilermakers' bills and worry, as when applied the cement metalizes, becomes part of the boiler and effects a permanent cure.

ATLAS PRESERVATIVES—BOILER, IRON AND WOOD

BOILER PRESERVATIVE E. prevents corrosion and the formation of scale. In boilers where corrosion is taking place it will effectually check it, and all scale will be entirely removed. The use of zinc plates and soda is dispensed with. By using **PRESERVATIVE E.** a boiler can be kept in better condition and at less cost. It is used by all the leading steamship lines and in many large power installations and mills. For water-tube boilers it has been especially recommended, as no matter how bad the feed water no scale is deposited on the heating surfaces, nor is corrosion allowed to take place.

PRESERVATIVE A. protects from white ants and other destructive insects, and from organic decay. In conjunction with coal tar, it is an effective substitute for creosoting. For railway tracks it is unique, as it is directly preservative to wood, iron and other metals with which it comes in contact, and scrub grass and weeds are eradicated.

BLUNDELL'S ALUMINUM PAINT

For all purposes. Will withstand heat, sea-water and all atmospheric conditions and has a neat and elegant appearance.

JOHN GIBSON

DEALER IN

NATIVE LUMBER

More than
50 VARIETIES
kept in stock

BLINDS, SASH, DOORS, ETC., MADE BY

Up-to-date
Machinery.

We manufacture all kinds of Furniture, Office Fixtures, Show Windows, Store Furnishings, Desks, etc., etc.

ESTIMATES FURNISHED ON APPLICATION.

San Miguel Saw Mill and Factory

Manila, P. I.

DENNISTON & STANFIELD

Sole Agents in the Philippines for

PURIFINE

TELEPHONE
492

THE WORLD'S DISINFECTANT
TRADE
PURIFINE.
MARK
CONSTANT-EFFECTIVE-CHEAP

P. O. Box
180

AN ODORLESS AND NON-POISONOUS

Disinfectant

HAVE YOU EVER USED A DISINFECTANT THAT WAS NOT OBJECTIONABLE IN SOME WAY? WE THINK NOT UNLESS YOU HAVE USED **PURIFINE.**

For Sale by all Druggists and Grocers

Room 15 Paris Bldg. = 34 Escolta = Manila, P. I.

J. P. WILSON

ENGINEER AND FOUNDER

Steam Launches, Agricultural Implements and Machinery

BOILER, MACHINE SHOP AND FOUNDRY

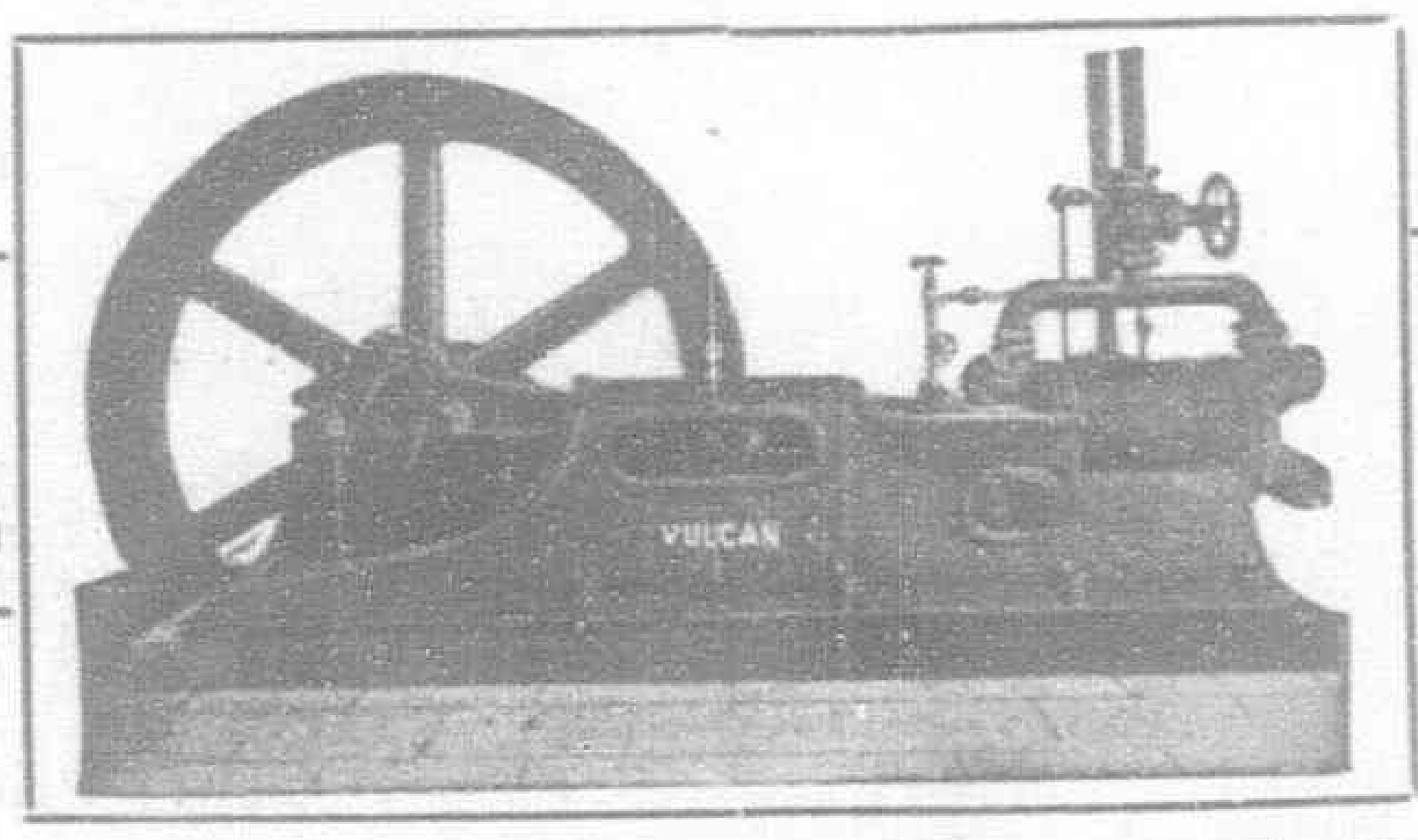
ALL CLASSES OF MACHINERY REPAIRED

Barraca No. 11, Binondo, Manila

VULCAN IRON WORKS

San Francisco, California, U. S. A.

VUL

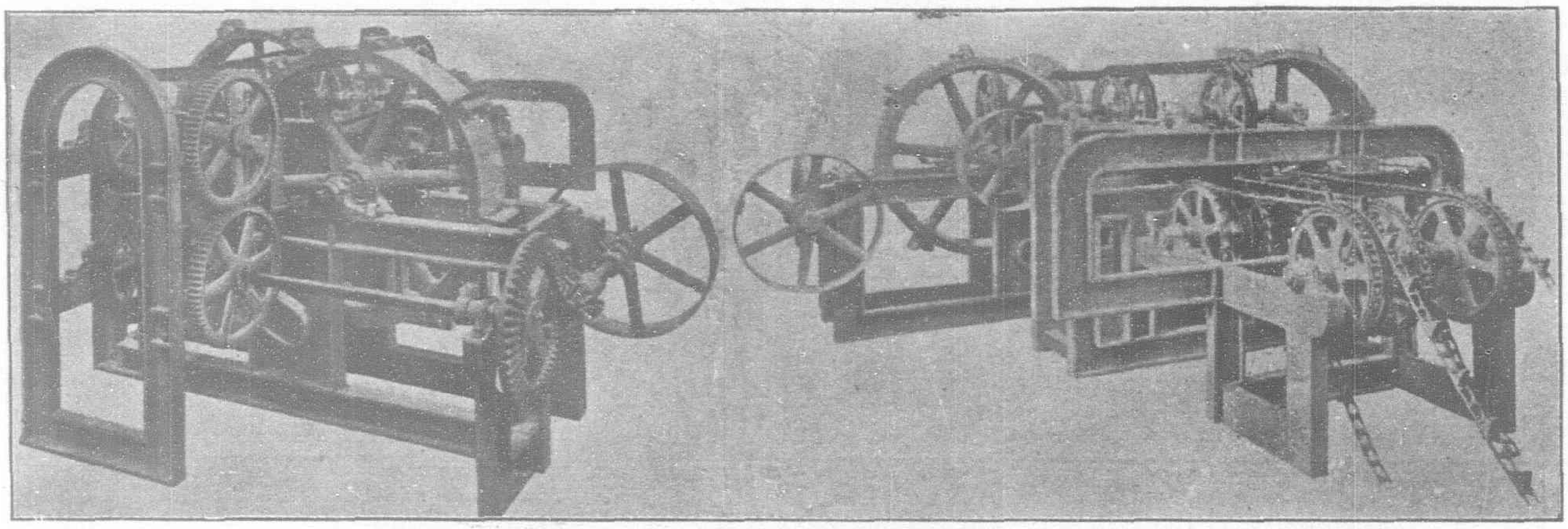


CAN

Ice Machines of Any Desired Capacity

SEND FOR
CATALOGUE

Cable Address: "VULCAN"
San Francisco



PIONEER FIBRE MACHINERY

FIBRE MACHINERY

WE MAKE THE MOST PERFECT AND EFFICIENT FIBER DECORTICATING MACHINERY IN THE WORLD

OUR MACHINES ARE IN USE IN ALL THE LEADING SISAL PLANTATIONS IN MEXICO, CUBA AND THE BAHAMAS

WRITE TO US FOR PARTICULARS AND PRICES

THE PIONEER IRON WORKS

149-163 Pioneer Street
BROOKLYN, N. Y., U. S. A.

SANTA
CRUZ
BRIDGE

WM. H. ANDERSON & CO.

IMPORTERS AND EXPORTERS: COMMISSION AGENTS

MANILA,
P. I.

AGENTS IN THE PHILIPPINES FOR

GREEN ISLAND CEMENT COMPANY, LIMITED

FARM AND ROAD WAGONS OF EVERY DESCRIPTION

LIBBY, McNEILL & LIBBY

SWIFT & COMPANY

BRUNSWICK,-BALKE COLLENDER CO.

CULTIVATOR.

DIEBOLD SAFES

AERMOTOR COMPANY

LUBRICATING OILS

DEERE IMPLEMENT COMPANY

HILBERT BROS.

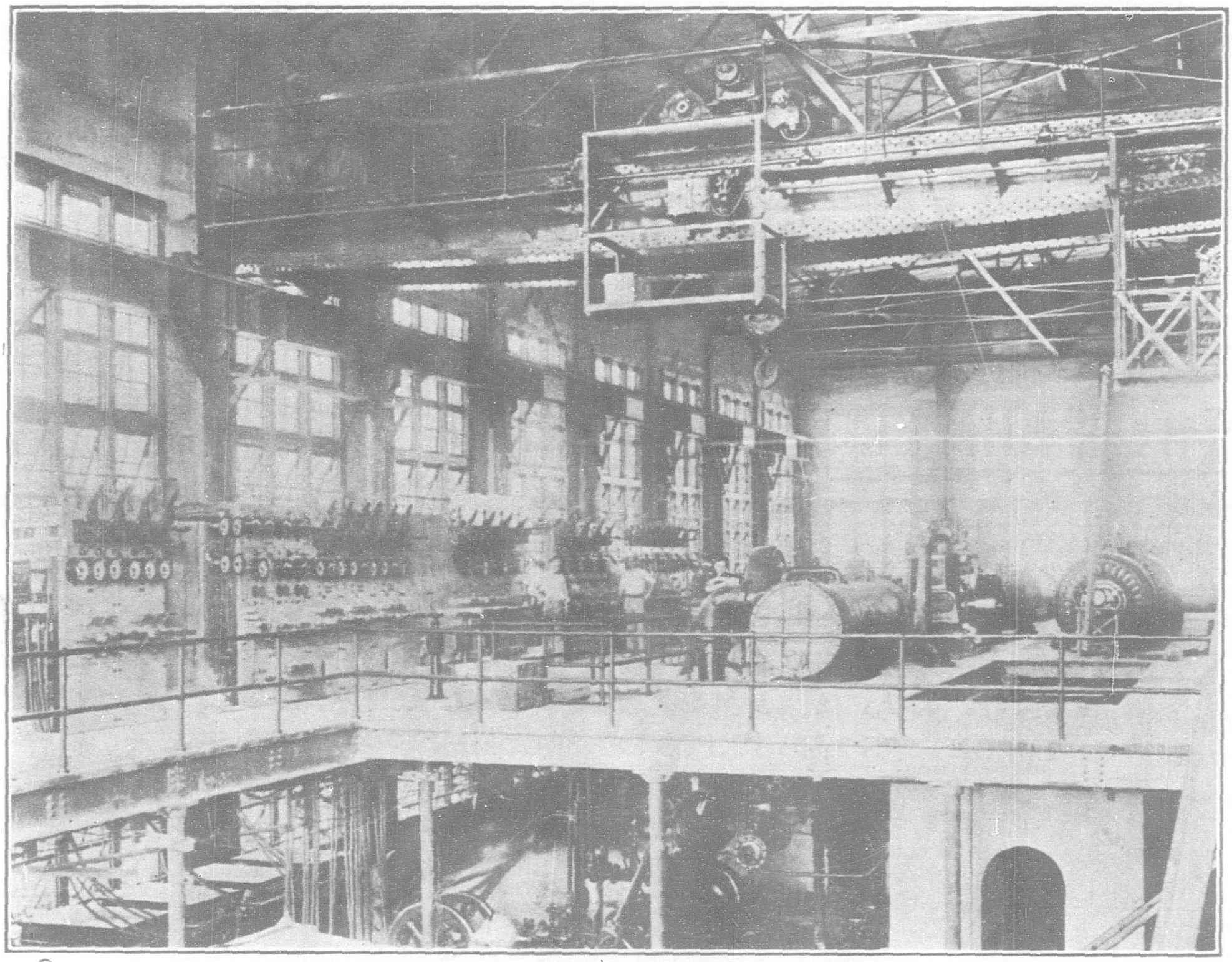
ETC., ETC.

AGRICULTURAL IMPLEMENTS

WESTINGHOUSE

ELECTRIC & MANUFACTURING CO.

Designers and Builders of Modern Electrical Machinery



ENGINE ROOM OF MANILA ELECTRIC RAILWAY AND LIGHT COMPANY'S PLANT, INSTALLED WITH WESTINGHOUSE EQUIPMENT

GENERATORS, MOTORS, ELECTRIC LOCOMOTIVES, LAMPS,
METERS AND HIGH GRADE SUPPLIES OF ALL KINDS

COMPLETE CENTRAL AND ISOLATED PLANTS AND
POWER TRANSMISSION SCHEMES A SPECIALTY

FAR EASTERN AGENTS

PHILIPPINES
Castle Bros.-Wolf & Sons
MANILA

JAPAN
Takata & Company
TOKIO

San Francisco to the East

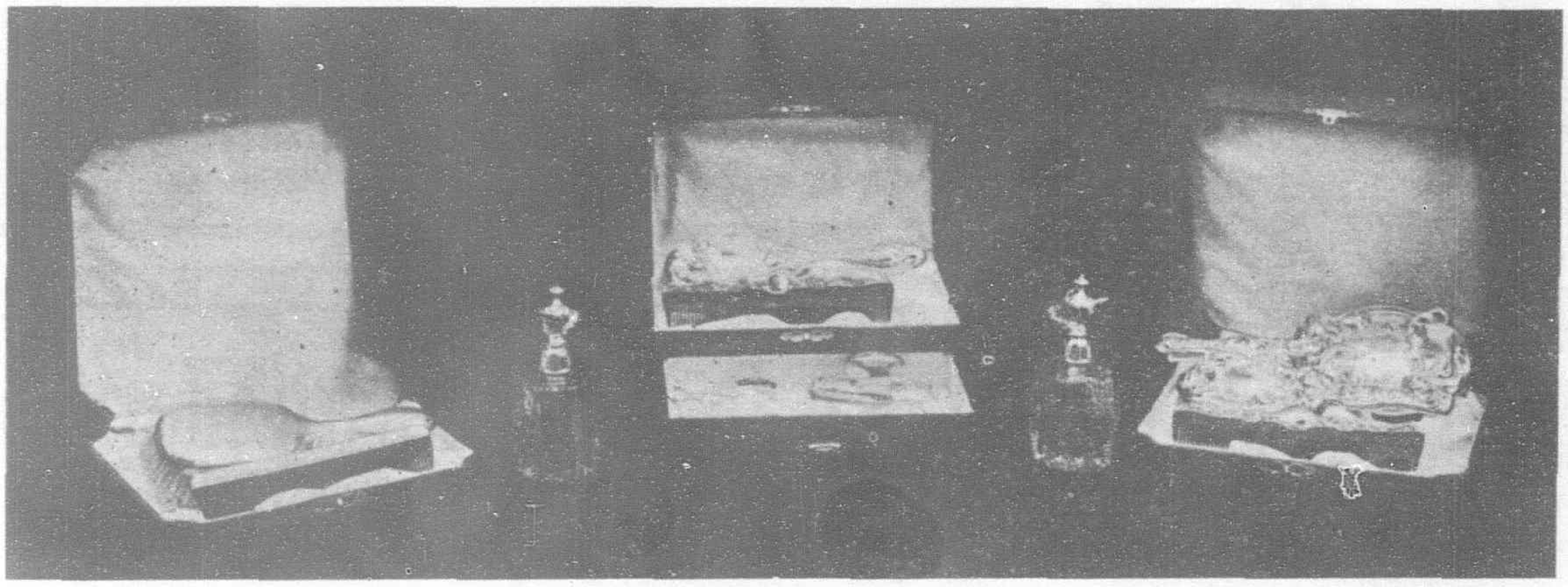
The Overland Limited

Electric-lighted parlor sleeping cars, combination buffet-library and drawing-room observation cars. Dinner all the way.

The Last Word in Luxurious Travel

Over the scenic route and straight across the Great Salt Lake by way of Lucin-Ogden cut-off, a wonderful triumph of modern engineering.

SOUTHERN PACIFIC



NECESSARY ARTICLES FOR YOUR DRESSER

Hair Brushes, Combs, Mirrors, Nail Files, Manicure Scissors, Buffers, etc.

We Have Just Received a New Line of These Goods in Sterling Silver Latest Designs which we Are Selling very Cheap

UPSTAIRS HEACOCK & CO., American Jewelers McCULLOUGH BLDG.

SAN MIGUEL BREWERY

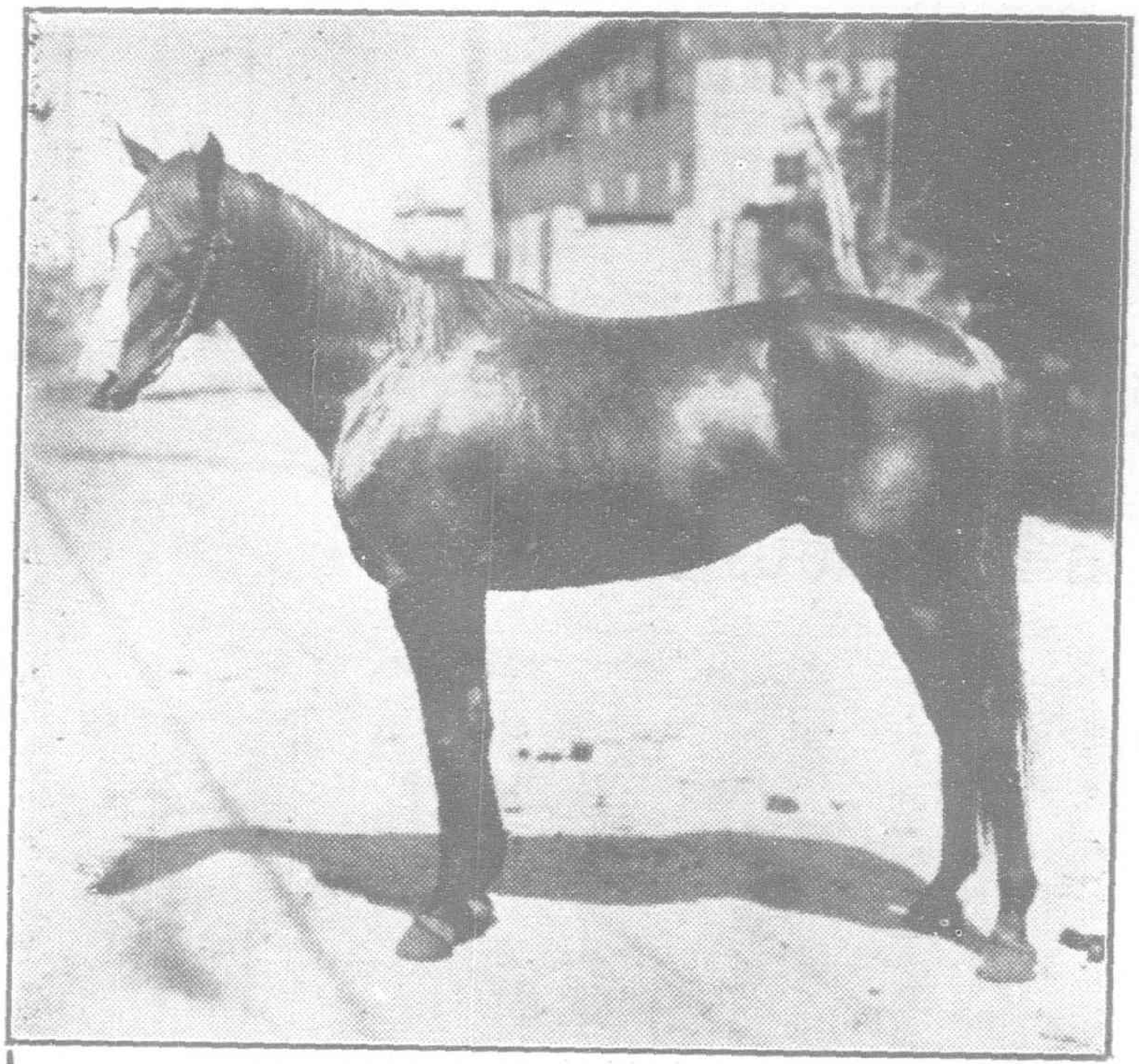
MANILA, P. I.

The Largest and Most Modern **Brewery** IN THE FAR EAST

Get into the Habit of Asking for **San Miguel**

IT IS ABSOLUTELY PURE

Containing No Trace of Injurious Chemicals



William Van Buskirk

PHONE 157 — Cable Address: STOCKMAN — P. O. Box 398

Codes: W. U. and A. B. C. 5th Edition

MANUFACTURER OF THE CELEBRATED

V. B.

BRAND

Crushed Food for Horses and Cattle

Importer and Dealer

In Horses, Mules, Cattle, Milch Cows, Sheep, Hogs, Poultry, Dogs, etc.

TIMOTHY HAY, OAT HAY, AUSTRALIAN COMPRESSED FODDER, ALFALFA, BRAN AND ROCK SALT

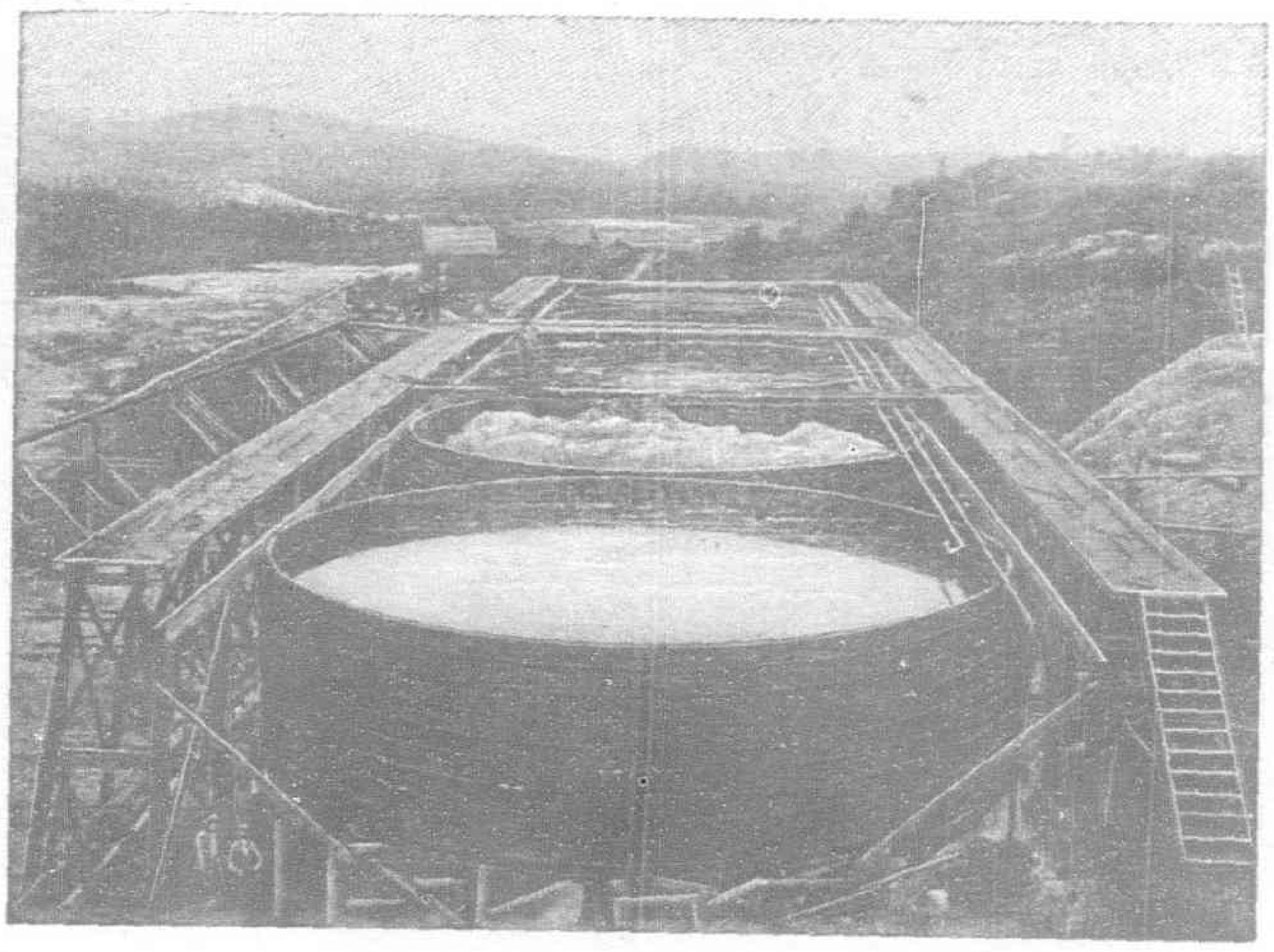
Contractor and Truckman

661 Bilibid — MANILA, P. I. — 661 Bilibid

CYANIDE AND MINING

TANKS

Complete Plants Furnished



PACIFIC TANK COMPANY

MANUFACTURERS

Mining, Oil, Water and Wine

TANKS

ILLUSTRATED CATALOG MAILED FREE. ADDRESS

PACIFIC TANK CO. Dept. "I" 301 Market St., San Francisco, Cal., U. S. A.

The B. W. Cadwallader Co.

CONTRACTORS AND BUILDERS

Wholesale and Retail Dealers in Oregon Pine, California Redwood, and Native Lumber

OWNERS AND OPERATORS OF EXTENSIVE

Saw and Planing Mills

SASH, DOORS, INTERIOR TRIM AND OFFICE FURNITURE MADE TO ORDER

Modern Cottages Built

AT REASONABLE PRICES

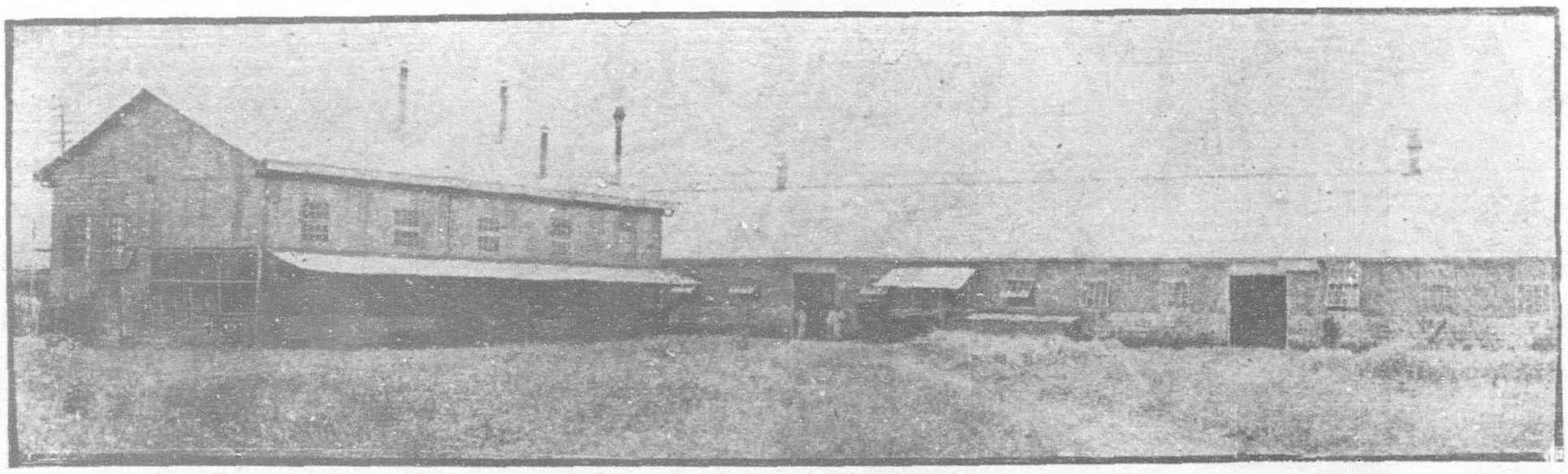
General Construction Work

OF ALL KINDS

Main Office and Mill
51 Tanduay
Telephone, 363

MANILA

Yard Office
299 San Miguel
Telephone, 364



"VULCANO" METAL WORKS

ENGINEERS, FOUNDERS AND MACHINISTS

SHEET METAL WORKS

Our New Works and Foundry Are Equipped to Construct and Repair Machinery and Boilers of all Descriptions

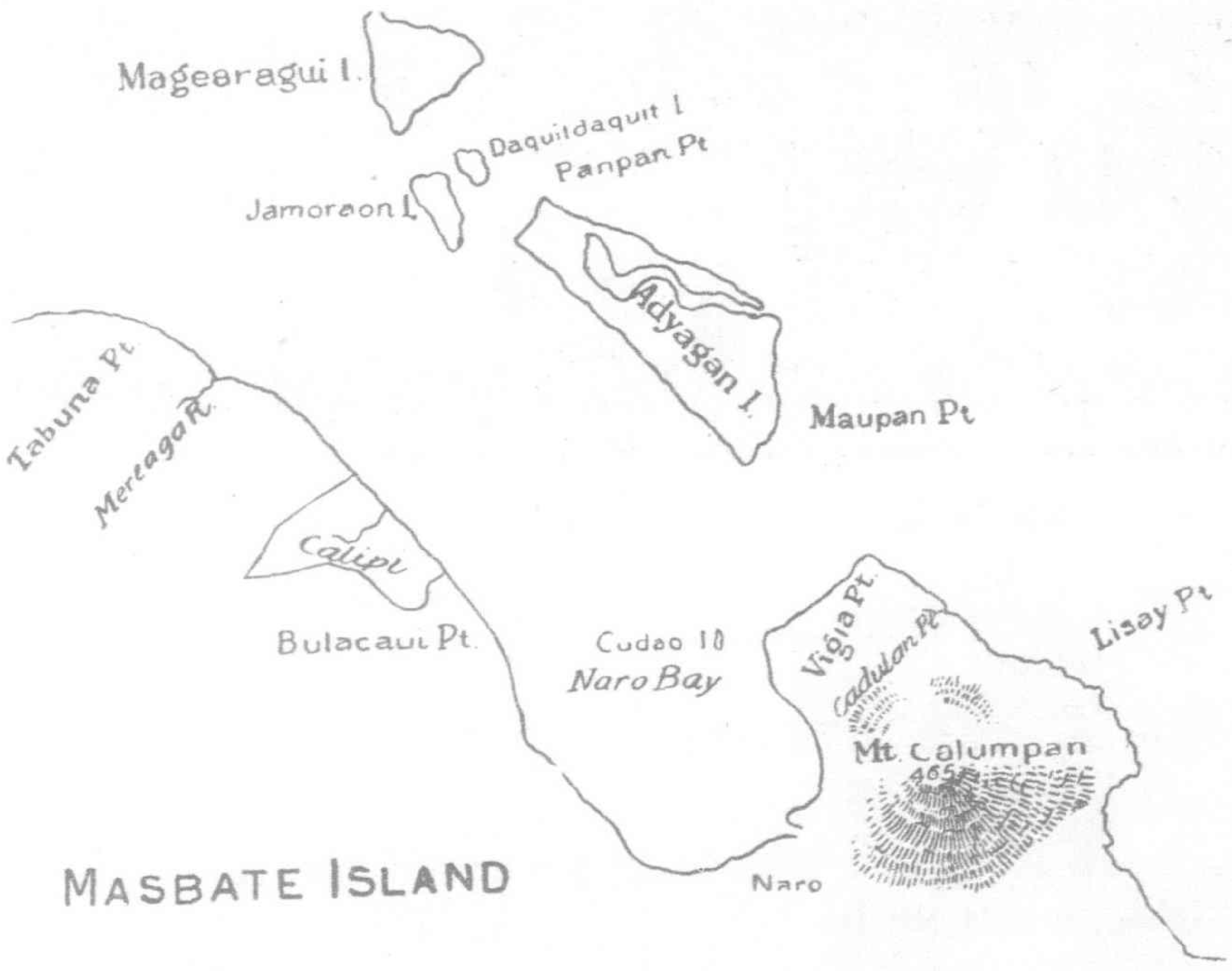
Cornices, Gutters, Ridges, Rainpipes, Metal Ceilings and Ornamental Metal Work a Specialty

Special Can Making Machinery—Nickel Plating

OFFICES
General Solano, 424
P. O. Box, No. 607

MANILA

SHOPS
Tanduay, 146
Telephone, No. 324



FOR SALE

Island of Adyagan
Hacienda de Calipi

BOTH OF THESE SPLENDID PROPERTIES ARE LOCATED IN THE PHILIPPINE ARCHIPELAGO AND ARE IN AN ADVANCED STATE OF CULTIVATION

The **ISLAND OF ADYAGAN** is the most productive cocoanut-growing district of the Islands, containing 25,000 trees of which 15,000 are yielding from 75 cents to $1 gold per tree. This island is located 20 minutes off the Island of Masbate, one of the most fertile sections of the Philippines, and a wonderful gold-producing region. **ADYAGAN** has an area of 255 hectares=630 acres.

HACIENDA DE CALIPI is situated on the mainland of Masbate, southwest of the **ISLAND OF ADYAGAN,** and consists of 180 hectares (445 acres). It lies in the most productive hemp districts of Masbate. There are warehouses, launches, etc., on the property; also warehouses in the Town of Naro. This bargain includes 3,000 feet of Molave and Tindalo, both being valuable native hard woods.

Address all inquiries to **T. BLANCO** 340 Calle Palacio, MANILA, P. I.

NATIVE WOODS

A FULL LINE OF NATIVE WOOD ALWAYS ON HAND

WINDOWS
DOORS
and
MOULDINGS
ALWAYS
in
STOCK

OUR
PRICES
are as
LOW
as
AMERICAN
LUMBER

CONTRACTS FOR CONSTRUCTION OF BUILDINGS
PROMPTLY AND ECONOMICALLY EXECUTED

The Manila Saw Mill
MANILA, P. I.

REINA REGENTE
106

TELEPHONE
471

PURE
MANILA ROPE

TANDUAY DISTILLERY
HEMP AND SUGAR
MERCHANTS

IMPORTERS AND EXPORTERS
OWNERS OF
HEMP AND SUGAR
ESTATES
SHIP CHANDLERS
DIRECT IMPORTATION

BRANCHES IN
ILOILO
SORSOGON
GUBAT
and MATNOG

ILOILO SUGAR
MERCHANTS
FOUNDERS
and MACHINISTS

SHIP OWNERS AND
CONSIGNEES

STEAMERS:—
SORSOGON
VIZCAYA
ANTONIO MACLEOD
VENUS
ELCANO
CHURRUCA
F. PLEGUEZUELO
CHICAGO
MAYON

YNCHAUSTI & CO.

BALUT—PURE—MANILA—ROPE—FACTORY

NEW CONNAUGHT HOTEL

HONGKONG

Centrally Located in the Principal Street of the Colony, and Within Close Proximity to the Wharves, Banks, Consulates, Steamship Offices and Clubs

A First-Class Commercial and Family Hotel with all Modern Conveniences, Including a Passenger Elevator, and Under Strictly American Management

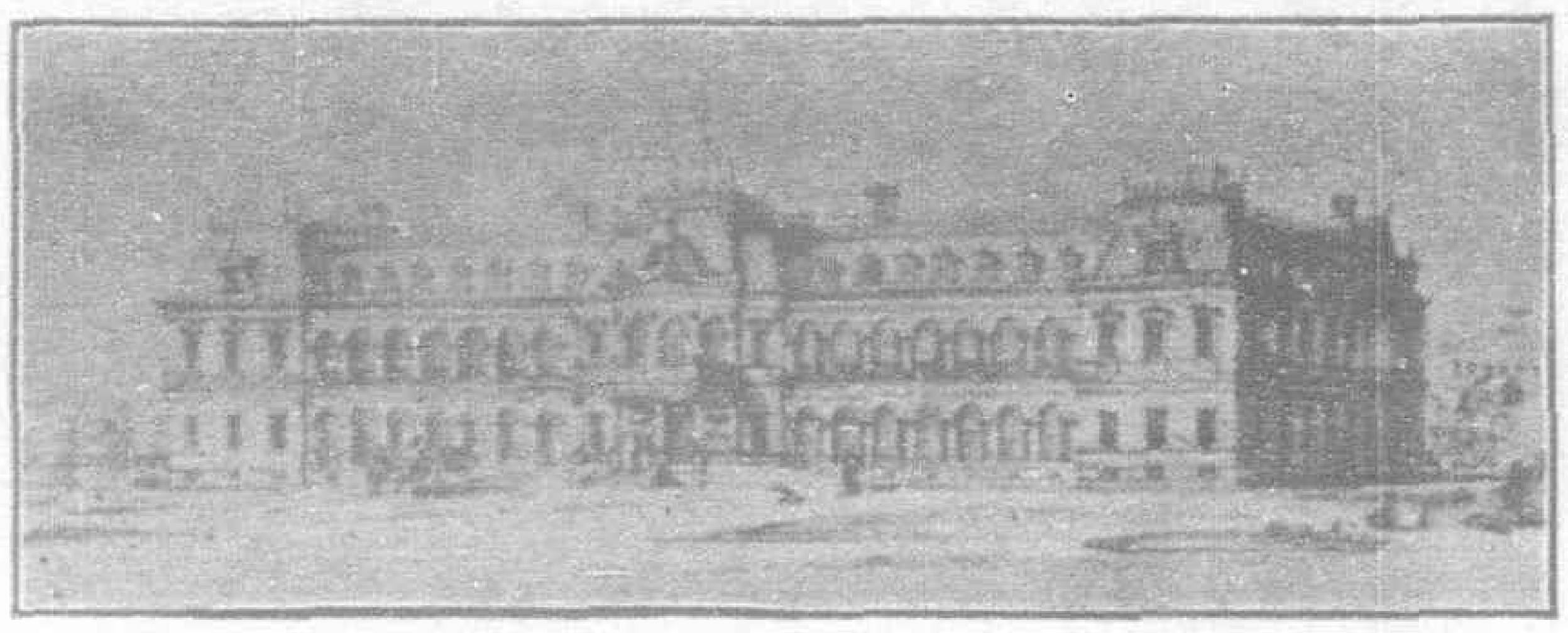
Excellent Cuisine and Wines; Large and Lofty Rooms, Elegantly Furnished

Provides the Most Comfortable Accommodations at Reasonable Rates

Hotel Launch Meets all Steamers

For further particulars, terms, etc., apply to

A. W. SLATON, Manager



Tokyo Imperial Hotel

Only First Class Hotel in Tokyo

Rates: 6 Yen and Upwards

EMIL FLAIG - - - - - - - MANAGER

K. SAKUMA
Managing Director

JAPANESE LABOR!!!

T. KAMIYA
Manager

Our Company is the Oldest and Most Reliable Concern of Its Kind in Japan

It is Duly Incorporated Under the Emigrant Protection Law of Japan, and Has for Years Controlled the Emigration Business of Japan for Australia, the West Indies, Fiji Islands, New Caledonia, Mexico, etc., etc., etc.

WE ARE PREPARED TO FURNISH ANY NUMBER OF JAPANESE LABORERS FOR RAILWAY CONSTRUCTION OR PLANTATION WORK, CARPENTERING, ETC., ETC. WRITE FOR PARTICULARS AND ESTIMATES

The Oriental Emigration Company

TOYO IMIN GOSHI KAISHA

HEAD OFFICE:
No. 10 Shinsakana-cho, Tokyo, Japan

Cable Address:
"SAKUMA TOKYO"

W. F. Stevenson & Co., Ltd.

ILOILO MANILA CEBU

MERCHANTS

STEAMSHIP AGENCIES

BOSTON STEAMSHIP COMPANY—BOSTON TOW BOAT COMPANY—"BEN" LINE OF STEAMERS—"INDRA" LINE OF STEAMERS—NORTHERN PACIFIC STEAMSHIP COMPANY—PENINSULAR AND ORIENTAL STEAM NAVIGATION CO. - - - - - - - -

INSURANCE AGENCIES

LIFE, STANDARD LIFE ASSURANCE CO.—MARINE, MARINE INSURANCE CO., LTD.—STANDARD MARINE INSURANCE CO., LTD.—BRITISH AMERICA ASSURANCE CO.—FIRE, NORWICH UNION FIRE INSURANCE SOCIETY—SCOTTISH UNION AND NATIONAL INSURANCE CO.—NATIONAL ASSURANCE COMPANY OF IRELAND—BRITISH AMERICA ASSURANCE CO.—NEW ZEALAND INSURANCE CO. - -

4 MUELLE DEL REY, MANILA, P. I.

AUSTRALIAN

COAL

TEL. 493

Prompt and
Free Delivery

We Solicit Provincial Orders

BEST FOR KITCHEN
FOR STEAMERS
FOR FACTORIES

FULL WEIGHT
MODERATE PRICES

V. MADRIGAL

24 Orozco, Quiapo

JOHN T. PICKETT FRANK O. ROBERTS

Pickett & Roberts

Manufacturers of Harness and Saddles

Wholesale Dealers in Saddlery, Hardware—Harness Fittings a Specialty

Our Illustrated Catalogue will be Ready January 1st, 1906

SEND US YOUR ADDRESS

36 ECHAGUE MANILA, P. I.

Ships, Launches
and Pontoons
Designed & Supervised

WILKS & JACK

CONSULTING ENGINEERS AND SURVEYORS

Cable Address:
"MARINEWORK"

AGENCIES

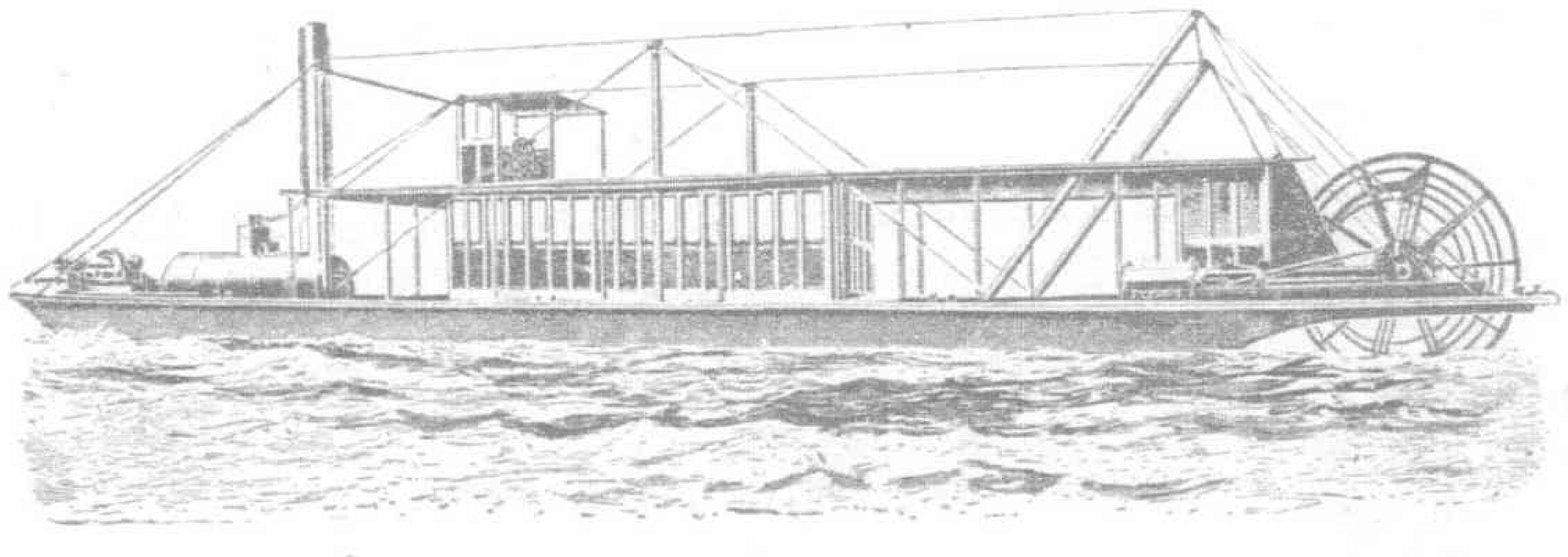
W. H. ALLEN & SONS, ENGINEERS,
BEDFORD.

H. W. JOHN'S CANADIAN ASBESTOS,
STOCK ON HAND

STEWART & LLOYDS,
Steel and Iron Plates, Tubes, etc.

THORNYCROFT'S
Motors and Launches,

GENERAL ELECTRIC CO., LONDON.



WE CARRY A LARGE STOCK
OF SHIP AND HOUSE FITTINGS,
WIRES, CABLES, LAMPS,
FANS, ETC.

ELECTRIC LIGHTS, LIGHTING,
MINING, PUMPING PLANTS, ETC.
BLAKE PUMPS AND VARIOUS
MACHINERY.

OFFICES NO. 12 BEACONSFIELD ARCADE, HONGKONG

Henry W. Peabody & Company

EXPORT AND IMPORT COMMISSION MERCHANTS

9 PLAZA DE P. MORAGA, MANILA, P. I.

OFFICES AT

New York	London	San Francisco	Cape Town, S. A.
Boston	Liverpool	Sydney, N. S. W.	Merida, Yucatan

Clarke's Mayon Coffee

THE MOST DELICIOUS BLEND OF SPECIAL SELECTED PURE PHILIPPINE AND MOCHA BERRIES

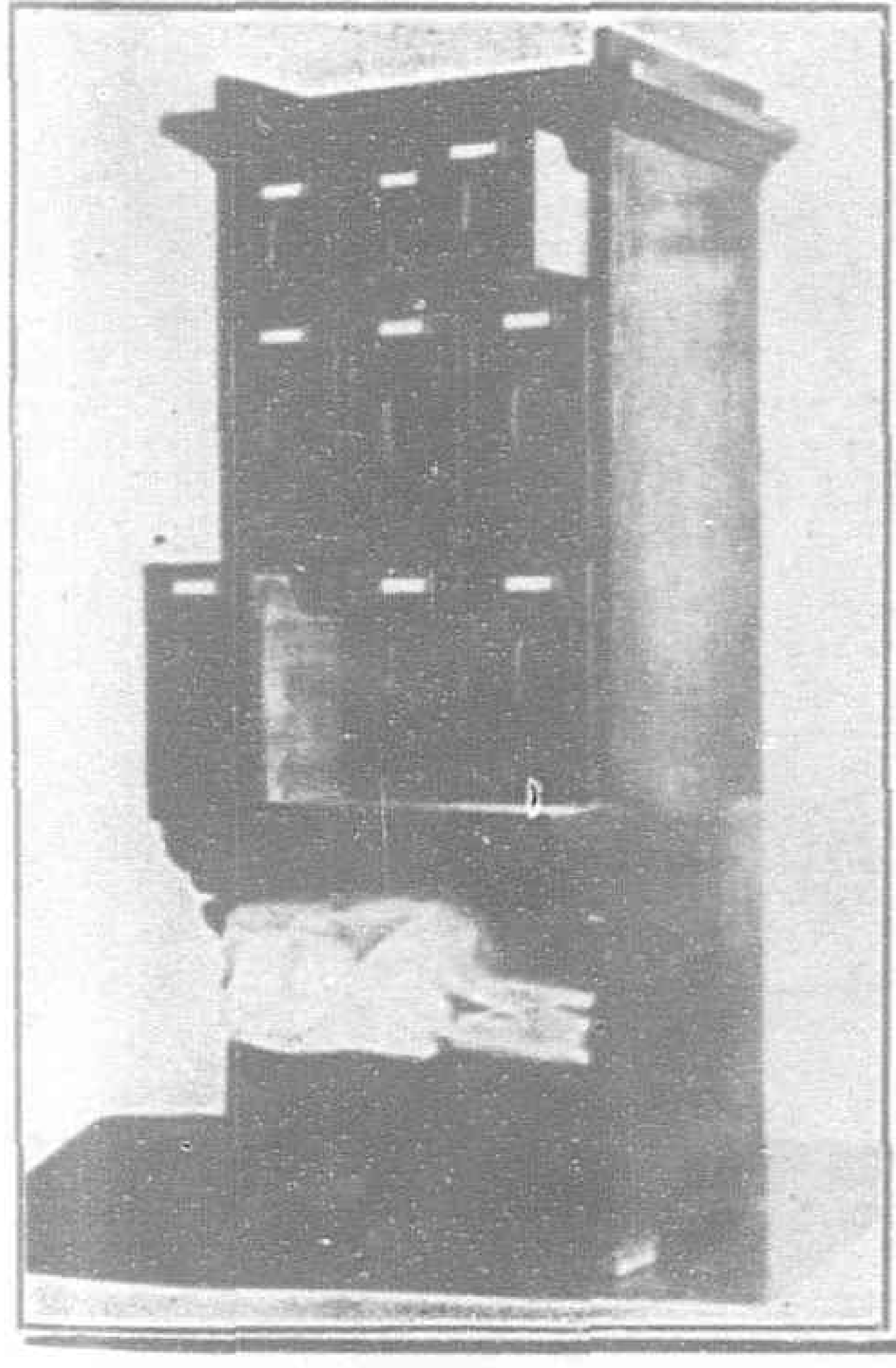
THE RECOGNIZED STANDARD OF EXCELLENCE IN THE FAR EAST

SOLD IN SPECIALLY PREPARED PACKAGES, AIRTIGHT AND MOISTURE PROOF, PRESERVING THE DELIGHTFUL AROMA OF THE COFFEE

WHOLESALE AND RETAIL

M. A. CLARKE

MANILA: NO. 2, ESCOLTA SHANGHAI: NO. 350, NANKING-RD



Have Your Office Furniture Made
For Your Individual Wants;
Don't Pay Two-Thirds of the Price
For Freight and Customs Duties

All Kinds of Office Fixtures
And Cabinet Work To Order

Estimates and Drawings Furnished on Request

TOM ANDERSON

39 PLAZA CERVANTES PHONE 172 MANILA, P. I.

Filing Cabinets

₱50

Philippine Currency

The Care of Your Horses

Scientific, Pathological and Experienced

HORSESHOEING

RACING HORSES PLATED IN THE MOST MODERN PRINCIPLES

FITTING THE SHOES to the Hoofs;
not FITTING THE HOOFS to the Shoes

RICHARDS & WILSON

Calle Lopez de Vega, off Cervantes
Behind Bilibid Prison Manila, P. I.

E. C. McCullough & Co.

INCORPORATED

Postoffice Box 610 MANILA, P. I.

Printers

Stationers

Copper-Plate and

Steel-Die Engravers

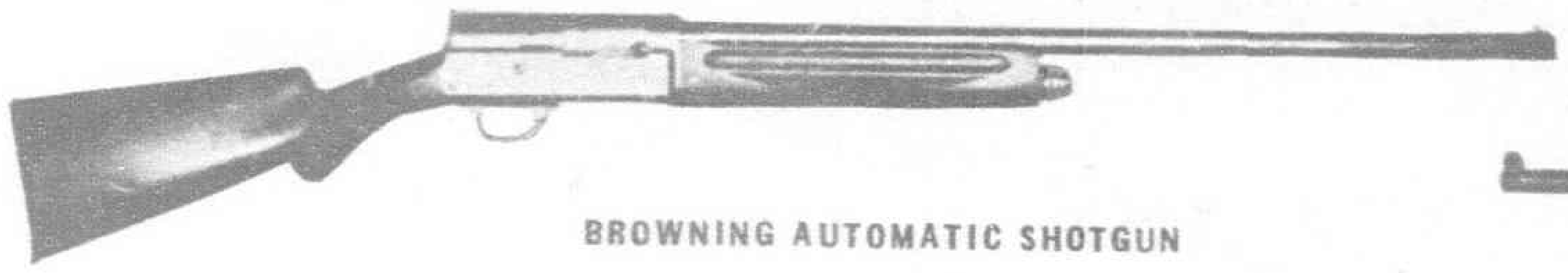
We Make a Specialty of Engraving and Stamping Heraldic Devices for Personal Correspondence Paper

Wedding Invitations and Announcements, at Home and Reception Cards, Visiting and Dinner Cards, etc., Done in the Latest Styles

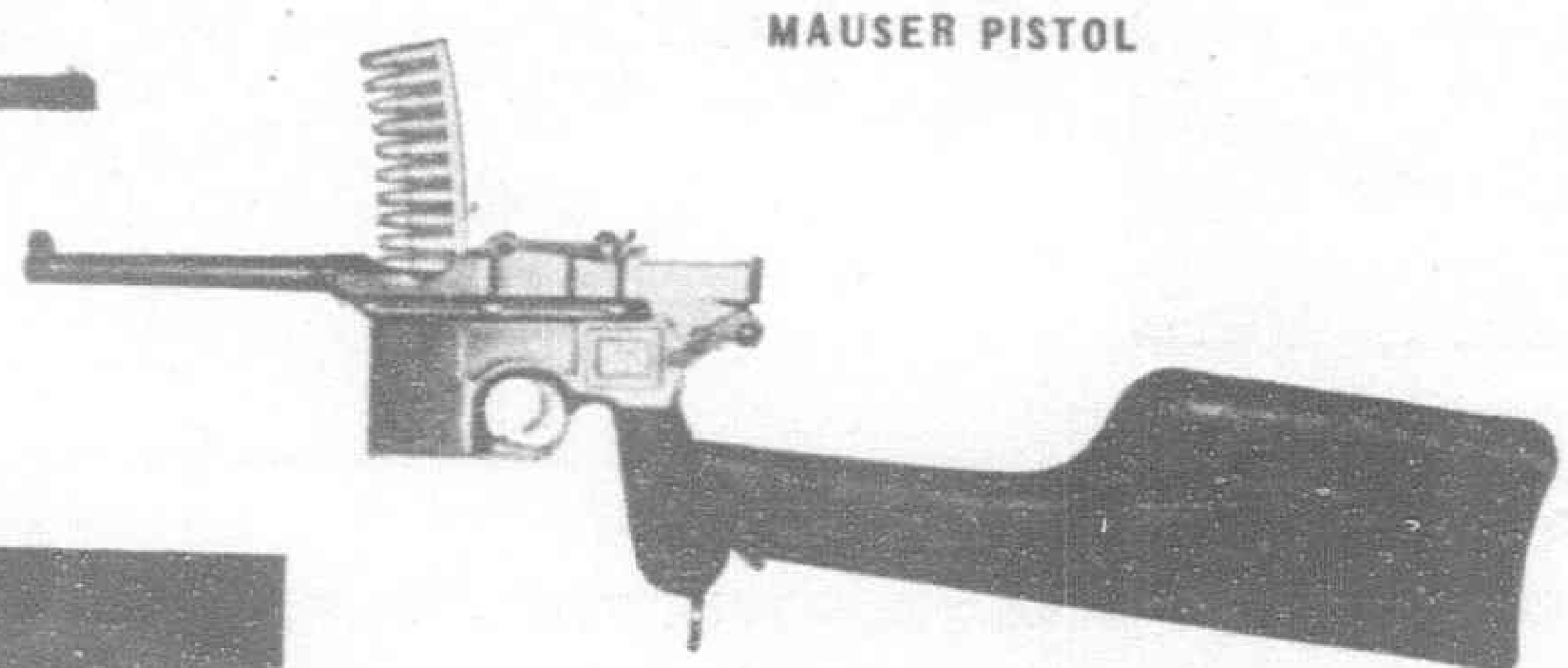
Prompt Attention Given to Mail Orders

ADOLFO RICHTER & CO.

MILITARY SUPPLIES AND EQUIPMENTS
ARMS AND AMMUNITIONS—GENT'S FURNISHINGS

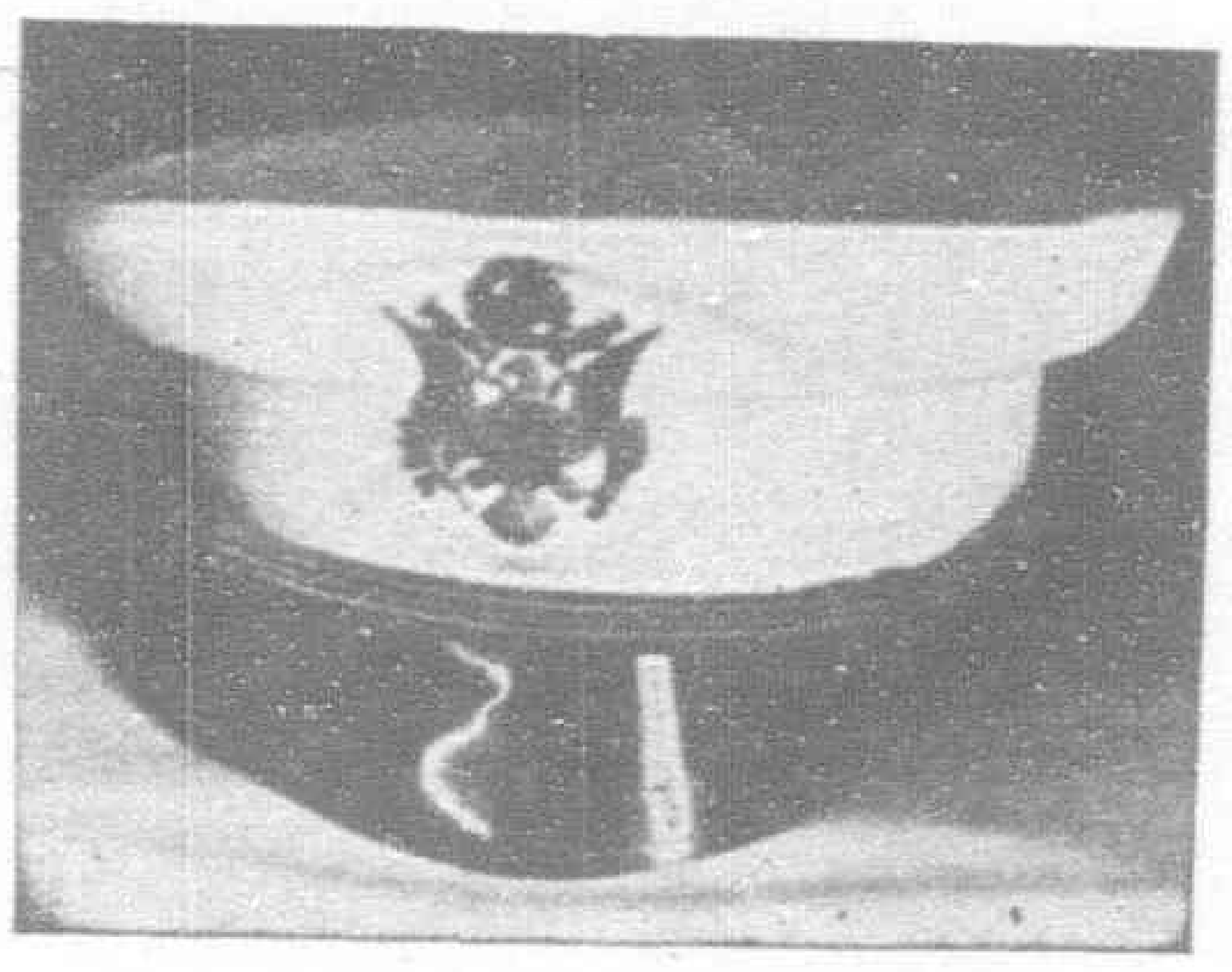


BROWNING AUTOMATIC SHOTGUN



MAUSER PISTOL

WINCHESTER ARMS CO.
REMINGTON ARMS CO.
HAENEL, SUHL
HARRINGTON-RICHARDSON (SHOTGUNS)
MAUSER RIFLES AND PISTOLS



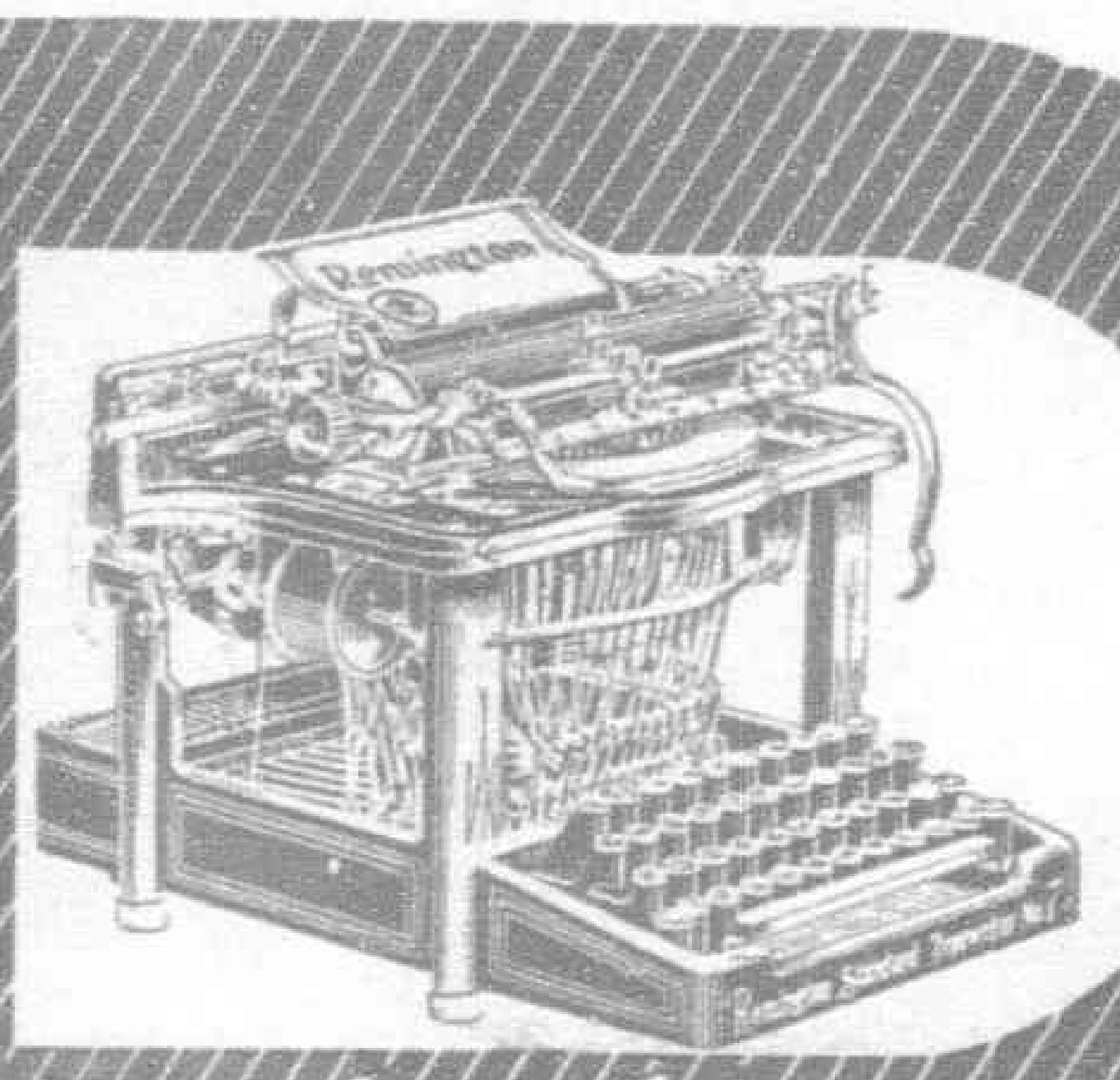
BROWNING AUTOMATIC SHOTGUNS
COLTS AND "S & W" REVOLVERS
CARTRIDGES AND SHELLS—
U. M. C., WINCHESTER, AND ELEY BROS. (LONDON)

MAIL ORDERS
PROMPTLY FILLED
P. O. BOX 778

57 Escolta, Manila, P. I.

The leading military house

Branch in ILOILO



Remington

Every Remington Typewriter *Lasts.*

Therefore Remington Supremacy *Lasts.*

Remington Typewriter Co.
327 Broadway, New York.

E. H. TUSKA . . . . Yokohama, Kobe.
MUSTARD & CO. . . . . Shanghai.
SIEMSSEN & CO. . . . . Hongkong.
E. C. McCULLOUGH & CO. . . . . Manila.

WINE AND SPIRIT MERCHANTS

LONDON
RANGOON STREET
CRUTCHED FRIARS

GLASGOW
SAINT ENOCH'S
SQUARE

ESTD 1864
TRADE MARK

SHANGHAI
FOOCHOW ROAD

HONGKONG
QUEEN'S ROAD

SINGAPORE
RAFFLES QUAY

TIENTSIN
CONSULAR ROAD

Caldbeck, Macgregor & Co.

GENERAL MANAGERS

THE AQUARIUS COMPANY

MANUFACTURERS OF PURE SPARKLING
MINERAL TABLE WATERS

AQUARIUS IS EVERYWHERE ESTEEMED AND PREFERRED
AS A HIGH CLASS TABLE WATER

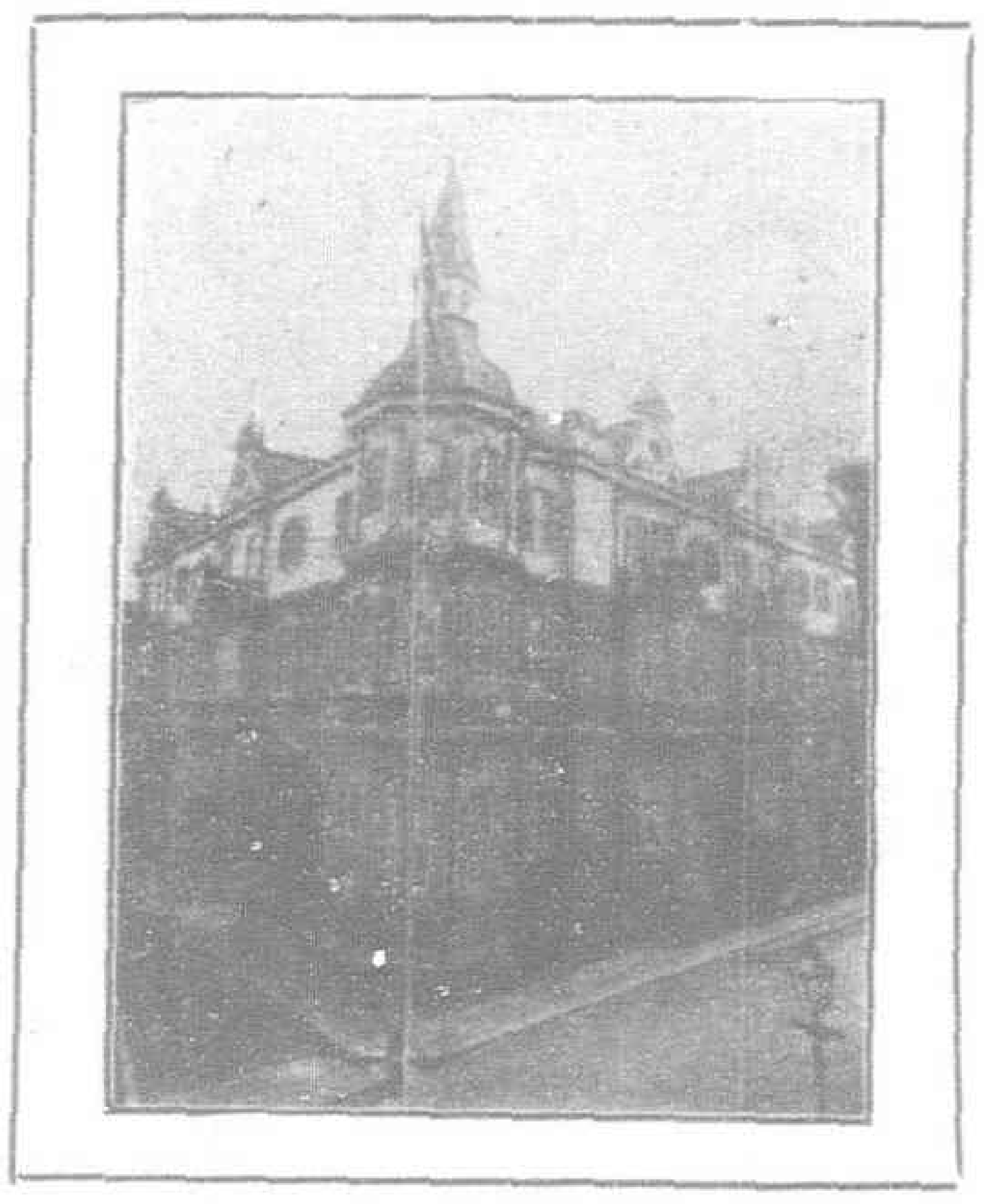
Abstract from ANALYTICAL REPORT of
Dr. John Muter of London.

"I find it ***Highly Aerated*** and in perfect condition, and to be made with ***Pure Distilled Water.***"

"It is ***Entirely Free from all Forms of Organic Contamination,*** and from microbes."

"I tested it for lead, copper, tin and all poisonous metals, but ***none were present.***"

"It is an ***Aerated Water of the Highest Quality,*** both from a manufacturing and sanitary point of view.



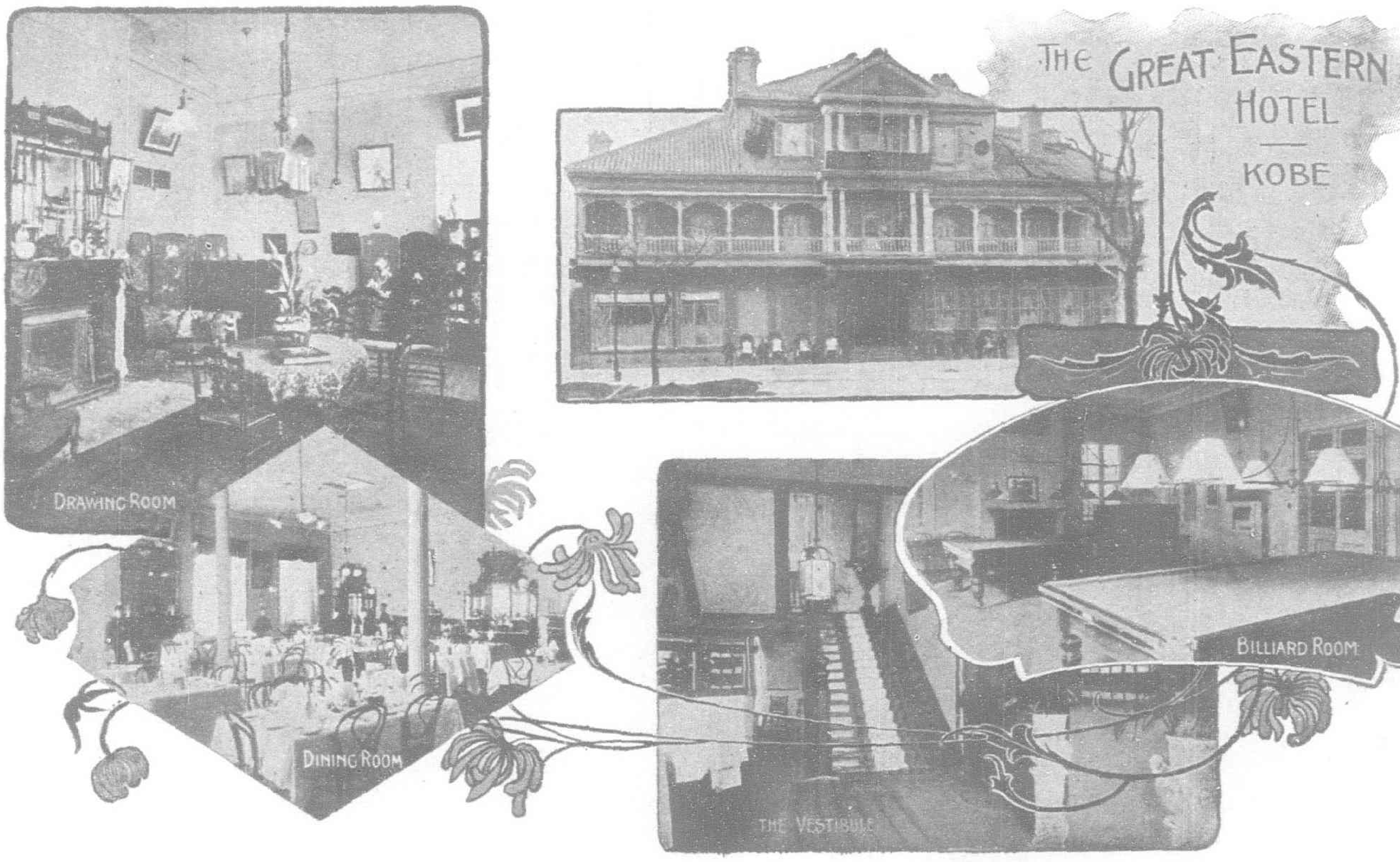
PHOENIX HOTEL

No. 87 Main Street, Yokohama

NEWLY ESTABLISHED AND MOST CONVENIENTLY LOCATED

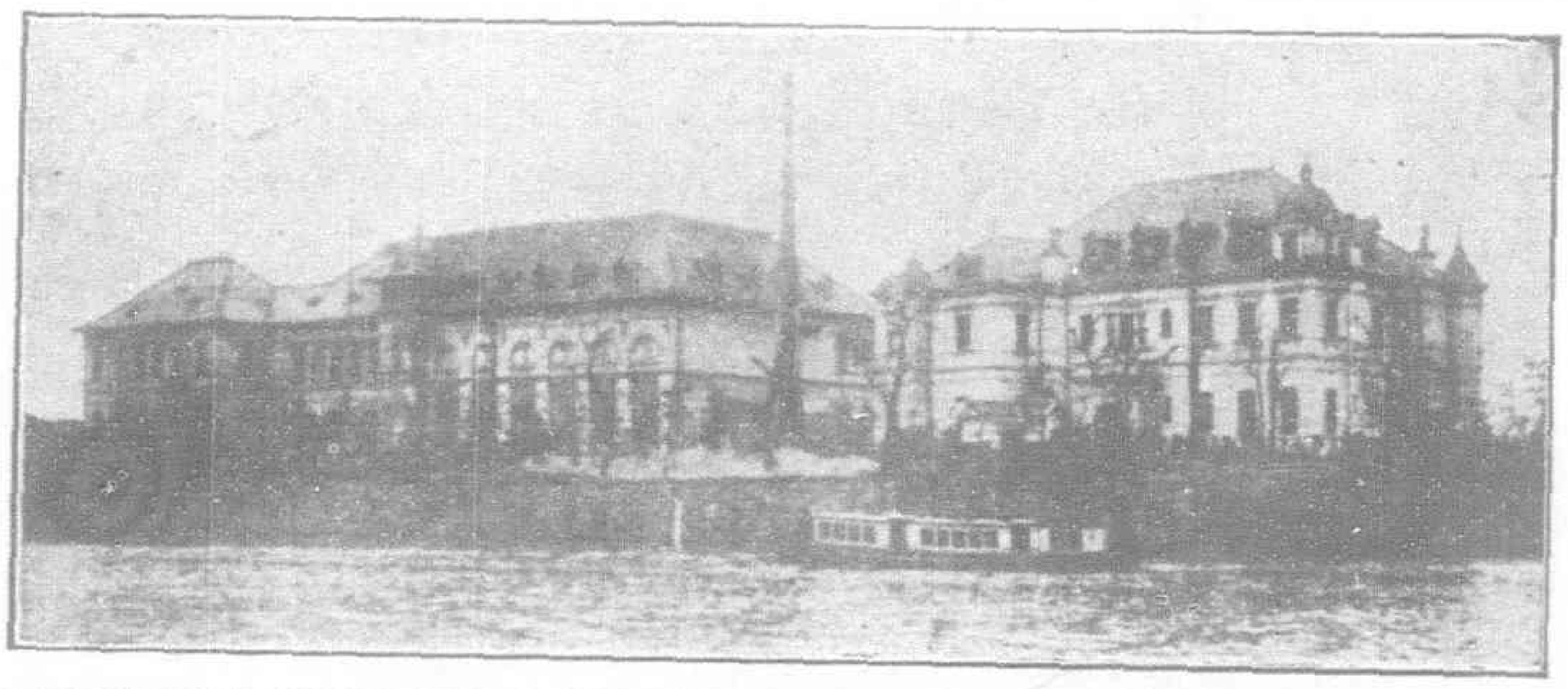
In Close Proximity with the Banks, Postoffice, Foreign Consulates and Public Offices--The Rooms are Well Ventilated and Newly Furnished—Cuisine Excellent—Best Billiard Tables—Six Regulation Bowling Alleys—*Rates* $1.50 U. S. Currency and Upwards—Special Arrangements for a Long Stay.

C. B. CLAUSEN, Proprietor



36 Division Street

C. M. ARRATOON, Manager



OSAKA HOTEL

FORMERLY OSAKA CLUB HOTEL

OSAKA JAPAN

TELEPHONE, NO. 713 HIGASHI

Newly built at the best location of the city in the Nakanoshima Park, facing the river on three sides.

Electric Light and Steam Heat Throughout
Excellent Cuisine and Best Attention : :

J. OSHIMA, Manager

TELEGRAPHIC ADDRESS:
"TABACALERA"

HEAD OFFICE:
BARCELONA

COMPANIA GENERAL DE TABACOS
DE FILIPINAS

Established in 1882. Capital: £ 3,000,000

Shipping Department, 80 Escolta.

Manila General Office, Calzada Marques de Comillas.

Retail Store, 80 Escolta.

COMPAÑIA GENERAL DE TABACOS
MARCA DE FÁBRICA
MARCA DE FÁBRICA
DE FILIPINAS

BRANCHES AND AGENCIES

in the principal cities of the world and towns of the Philippines

Proprietors of the celebrated factories

"La Flor de la Isabela"

High grade cigars manufactured with the most selected leaf grown in the estates of the Company.

SPECIAL BRANDS:

Pig's tails, Vegueros Especiales, Regalia A. Lopez, Regalia G. Pereire, Favoritos A. Lopez, Favoritos A. Correa, Perfectos Especiales, Exquisitos, Reina Victoria, etc.
Excellent common brands.

"La Clementina"

Alcohol Manufactures—Gin—Distilled Spirits

GENERAL IMPORTERS AND EXPORTERS

A very extensive coastwise service with up-to-date Steamers

AGENTS FOR

COMPANIA TRASATLANTICA SS. CO.
(Spanish Royal Mail)

Direct service between Philippines, Spain, and England. Through tickets to and from New York issued. Lines of Steamers to all ports of the World.

FAR EASTERN BRANCH AGENCIES:

YOKOHAMA............ 240 Settlement.
SHANGHAI.............. J. DELBOURGO, 29 Rue du Consulat.
HONGKONG .... A. R. MARTY, 2 Pedder-st.
SINGAPORE .... Max. STOLZEL, 4 Battery-rd.

Allison D. Gibbs Herbert D. Gale Wm. J. Carr

GIBBS, GALE & CARR
LAWYERS

OFFICE: No. 21 PLAZA MORAGA (Over International Bank)
MANILA, P. I.
Telephone No. 174

CORPORATION LAW

INVESTIGATIONS AND REPORTS ON EXISTING OR PROSPECTIVE INDUSTRIAL INVESTMENTS

COLD STORAGE
&
ICE TRADE JOURNAL
Produce Exchange, New York

¶THE LEADING NEWS AND TECHNICAL MAGAZINE OF THE REFRIGERATING, ICE MAKING, NATURAL ICE AND ALLIED TRADES.

¶COVERS EVERY PHASE OF THESE INDUSTRIES EVERYWHERE.

RATES OF SUBSCRIPTION
United States and Dependencies, and Canada and Mexico........................ $2 00
Foregoing Countries in Postal Union... 3.00
SAMPLE COPY ON REQUEST

"International" Kerosene Engines

1½ to 20 H. P.

For Stationary or Marine Use
Kept in Stock

Frazar & Co.

8 Hankow Road Shanghai

THE AMERICAN
SUGAR INDUSTRY
AND BEET SUGAR GAZETTE

It covers every branch of the sugar industry and contains contributions from sugar experts in all parts of the world.

The most progressive sugar trade journal printed in the English language. Brimful of sugar news and facts gathered from all sugar producing countries.

Subscription price, $2.50 per annum.
Foreign countries, $3 00 per annum.

Sample copies and advertising rates will be cheerfully sent upon request.

BEET SUGAR GAZETTE COMPANY, Publishers,
No. 145 La Salle Street, Chicago, Ill., U. S. A.

"GERMINAL"
CIGAR AND CIGARETTE FACTORY
4 CALLE MARQUES DE COMILLAS
MANILA, P. I.

TRADE GERMINAL MANILA MARK

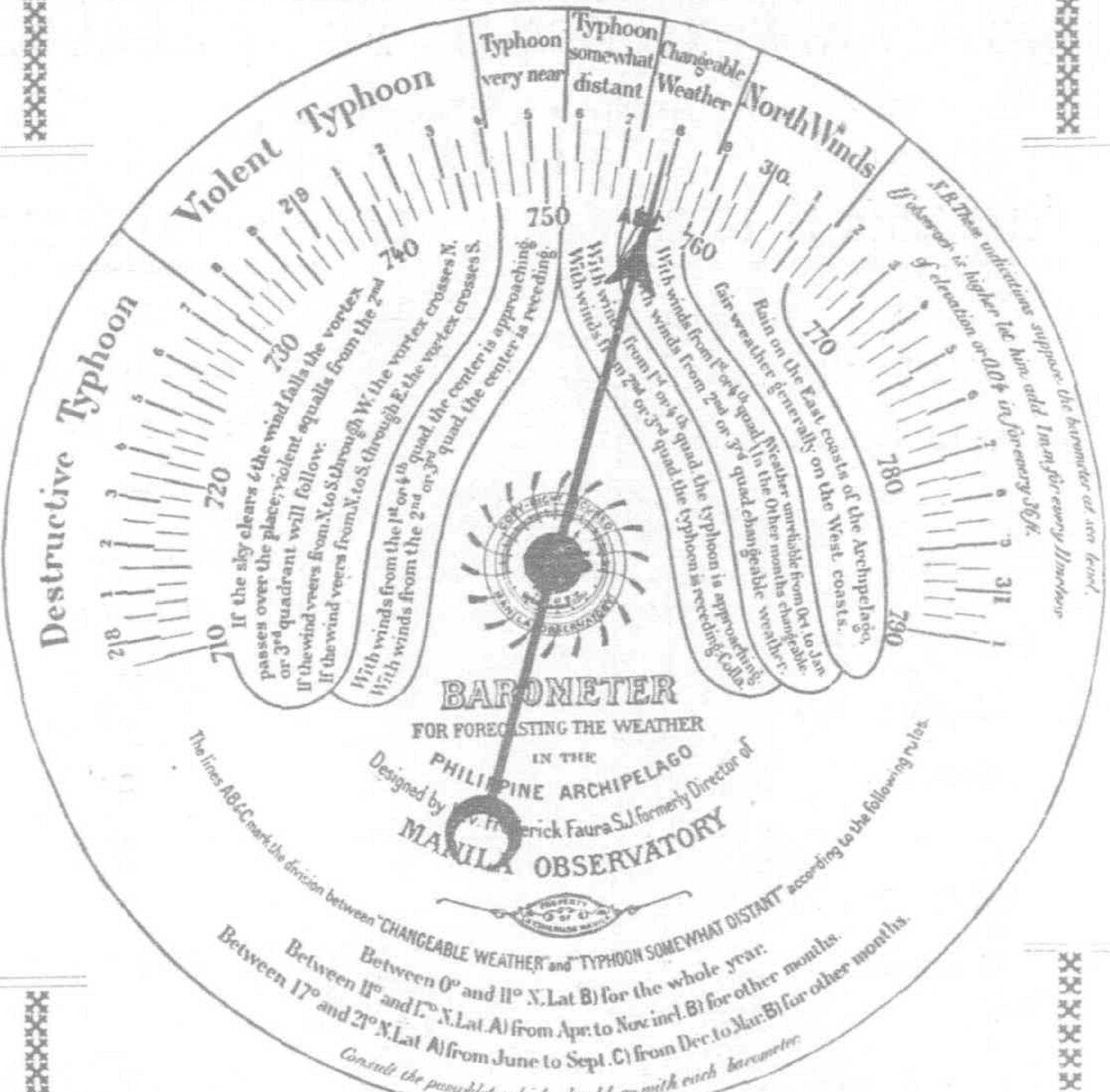
GERMINAL CIGAR
The Universal Favorite

This means the approval of discriminating critics; and shows an appreciation of the delicious richness of the choicest tobacco leaf, the exquisite aroma of an original blend, the finished touch throughout of an expert's hand.

For a mild Cigarette Smoke
Try the
"FLOREAL"

TRADE "floreal" MARK

LA ESMERALDA
BLANC & BRUNSCHWIC
JEWELRY AND DIAMONDS—FANCY GOODS—SILVER WARE
American and Swiss Watches


Destructive Typhoon
Violent Typhoon
Typhoon very near
Typhoon somewhat distant
Changeable Weather
North Winds
710
720
730
740
750
760
770
780
790
If the sky clears & the wind falls the vortex passes over the place; violent squalls from the 2nd or 3rd quadrant will follow.
If the wind veers from N. to S. through W. the vortex crosses N.
If the wind veers from N. to S. through E. the vortex crosses S.
With winds from the 1st or 4th quad. the center is approaching.
With winds from the 2nd or 3rd quad. the center is receding.
Fair weather generally on the West coasts.
Rain on the East coasts of the Archipelago.
N.B. These indications suppose the barometer at sea level.
BAROMETER
FOR FORECASTING THE WEATHER
IN THE
PHILIPPINE ARCHIPELAGO
Designed by Rev. Frederick Faura S.J. formerly Director of
MANILA OBSERVATORY
The lines AB & C mark the division between "CHANGEABLE WEATHER" and "TYPHOON SOMEWHAT DISTANT" according to the following rules.
Between 0° and 11° N. Lat B) for the whole year.
Between 11° and 17° N. Lat. A) from Apr. to Nov incl. B) for other months.
Between 17° and 21° N. Lat A) from June to Sept. C) from Dec. to Mar. B) for other months.
Consult the pamphlet which should go with each barometer

9-11 ESCOLTA MANILA, P. I.
Sole manufacturers of the FAURA barometer

THE PHILIPPINE JOURNAL OF SCIENCE
Edited By PAUL C. FREER, M. D., Ph. D.
Co-Editors: H. D. McCASKEY, B. S.; RICHARD P. STRONG, M. D.
PUBLISHED BY THE BUREAU OF SCIENCE OF THE PHILIPPINE ISLANDS
A Journal giving the results of investigations on economic and scientific subjects completed in the Bureau of Science.

Vol. I. OCTOBER, 1906 No. 8.

CONTENTS

WORCESTER, DEAN C. The Non-Christian Tribes of Northern Luzon.

COX, ALVIN J. A Report on Philippine Coal and Its Gas-Producing Power.

McGREGOR, RICHARD C. Notes on a Collection of Birds from Palawan Island.

Subscription, $5 U. S. currency per year. Single copies, 75 cents. Reprints of individual articles, 25 cents. Where an article is a serial one, the cost of the reprint will be one-third the numbers of *The Journal* involved. Communications should be addressed to The Director of Printing, Manila, P. I.

"Open the old cigar box
and let me consider a space"

SOME OF OUR LEADERS

Reina Victoria
Incomparables
Imperiales
High Life
Panetelas
Favoritos
Princesas
Perfectos
Marines
Londres
Regalia

Consider!

That the Alhambra Cigar Factory uses none but the finest selected Isabela leaf.
That its cigars are manufactured in all shapes and sizes in the most approved modern form.
That the quality of each and every grade is strictly maintained.
That our prices are as low as the lowest.
That quality, grade and price are absolutely guaranteed.
That correspondence will be promptly answered.
That catalogs, price lists and samples are furnished on application.

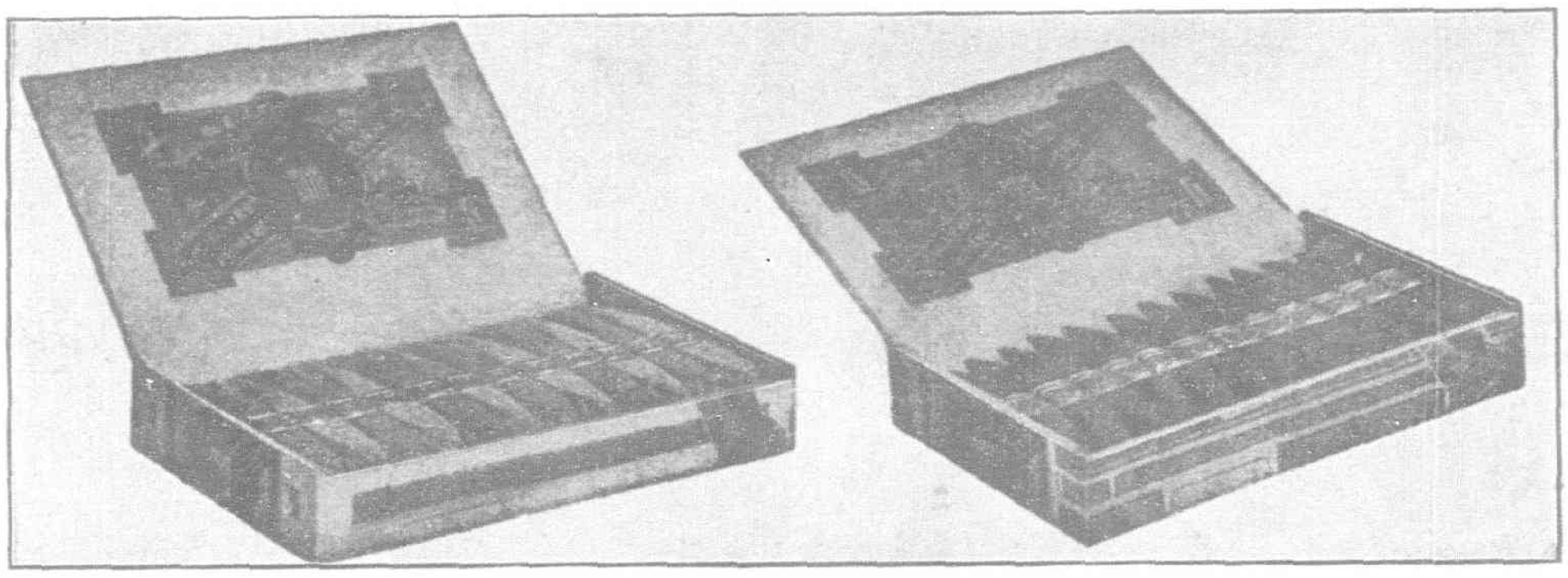
Alhambra Cigar and
Cigarette Factory
MANILA

LA URANIA CIGAR FACTORY, LTD.

SPRUNGLI & CO., Managers

MANILA PHILIPPINE ISLANDS

LA UNION



LA UNION

Makers of the
Well-known Brand

LA UNION

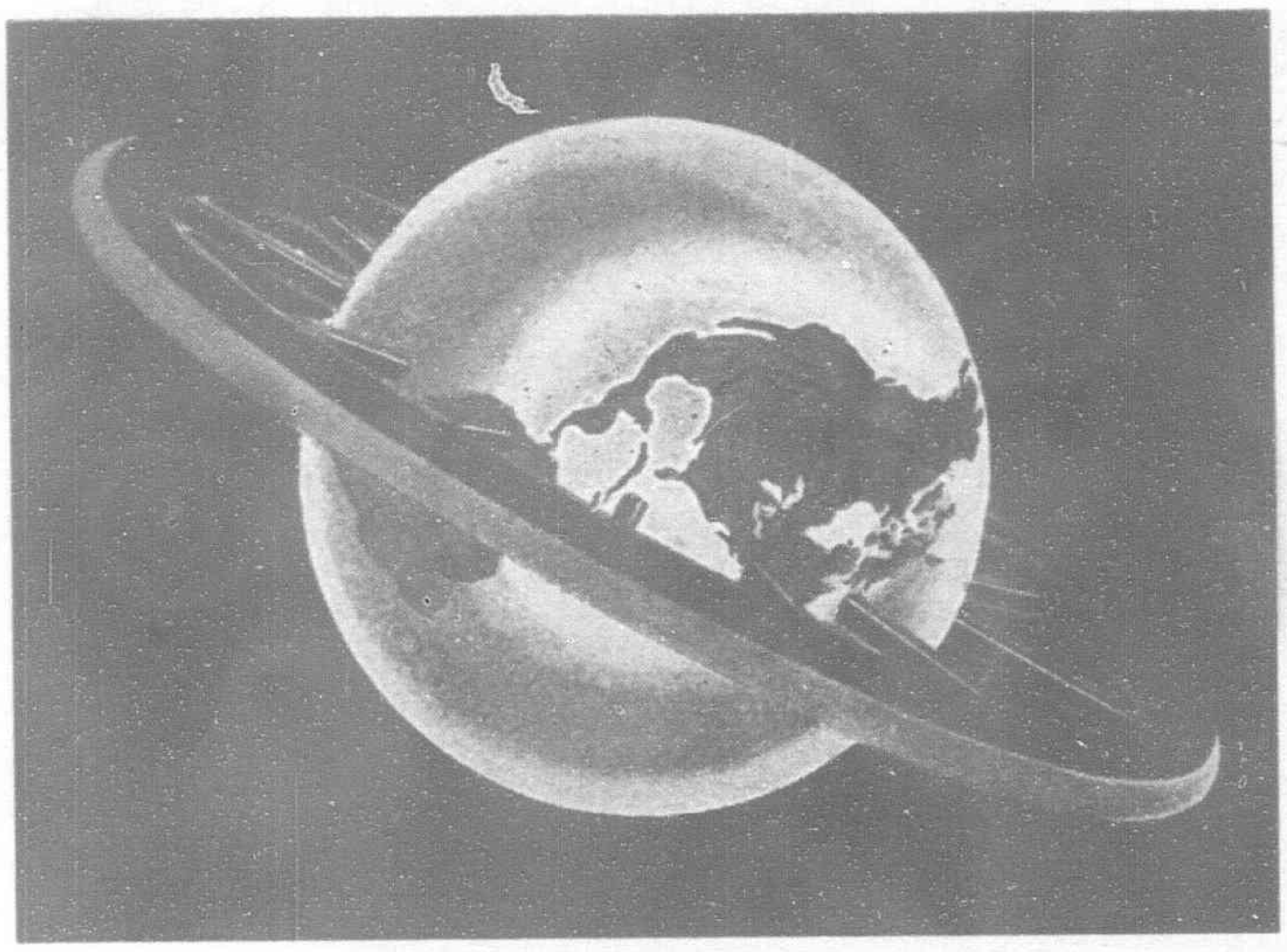
Apply for Terms
and Price Lists

WALDORF LIVERY STABLES

Well-Equipped,
Elegant and Serviceable
Carriages and Calesas

D. B. JOHNSON,
Proprietor

Telephone No. 266
MANILA, P. I.



They Do Not

Jar You!

Always Easy and Smooth
Like a Swing

Carriage Builders Everywhere
Swear by Them

KELLY SPRINGFIELD TIRES

BETTER PUT THEM ON YOUR RIG—DONE WHILE YOU WAIT AT

Kelly Springfield Road Roller Co. *157-167 MUELLE DE LA REINA*

C. E. HELVIE, Manager

ALBERT J. G. DENNEY
MINING ENGINEER,
TIENTSIN, NORTH CHINA

SURVEYS OF MINERAL CLAIMS, TOWNSITES, COAL AND TIMBER CLAIMS, LAND PURCHASES, ETC.

REPORTS ON MINES AND MINERAL CLAIMS. GOLD MINES A SPECIALTY. EXPLORATION, SURVEYS, ETC.

Cable Address: DENNEY, TIENTSIN
Codes: Bedford McNeil, Moreing & Neal: A B C, New Edition.

BUREAU OF SCIENCE
MANILA

Glycerinated vaccine virus, bacteriologically sterile, physiologically tested before shipping, furnished in vials of 100 units, 50 units, 25 units, and in tubes of 5 and 1 unit, price per unit, ₱	.03
Diphtheria antitoxin, 2000 units,	6.50
Mallein, per dose	1.00
Plague prophylactic, (Lustig or Haffkein) per cc	.30
Cholera prophylactic, (Strong) per cc	.50
Plague prophylactic per 30 cc	2.50

PRICES IN PHILIPPINE CURRENCY

PACKING, POSTAGE OR FREIGHT, 10 PER CENT ADDITIONAL

REMITTANCES TO BE MADE TO
G. M. Nell, Cashier,
BUREAU OF SCIENCE, MANILA.

Pittsburg Testing Laboratory, Ltd.

Inspecting and Metallurgical Engineers and Chemists

SPECIALTIES: Inspection of Rails and all material for Bridges, Buildings, and other structures, Boiler and Engine Tests

Chemical Analysis and Physical Tests of all kinds.

Chicago, 1750 Monadnock Block.
Philadelphia, 960-7 Crozier Building.
New York, 60 New Street.
Richmond, Va., 1107½ E. Main Street.

Pittsburg, Pa. 325 Water St.

HARTIGAN, ROHDE & GUTIERREZ
ATTORNEYS-AT-LAW
Calle Cabildo and Santo Tomas - - - Manila, P. I.

Special attention given to perfecting land titles, etc., in the Philippine Islands

A. J. EVELAND

Mining Engineer and Geologist; Late Geologist, Mining Bureau, Philippine Islands

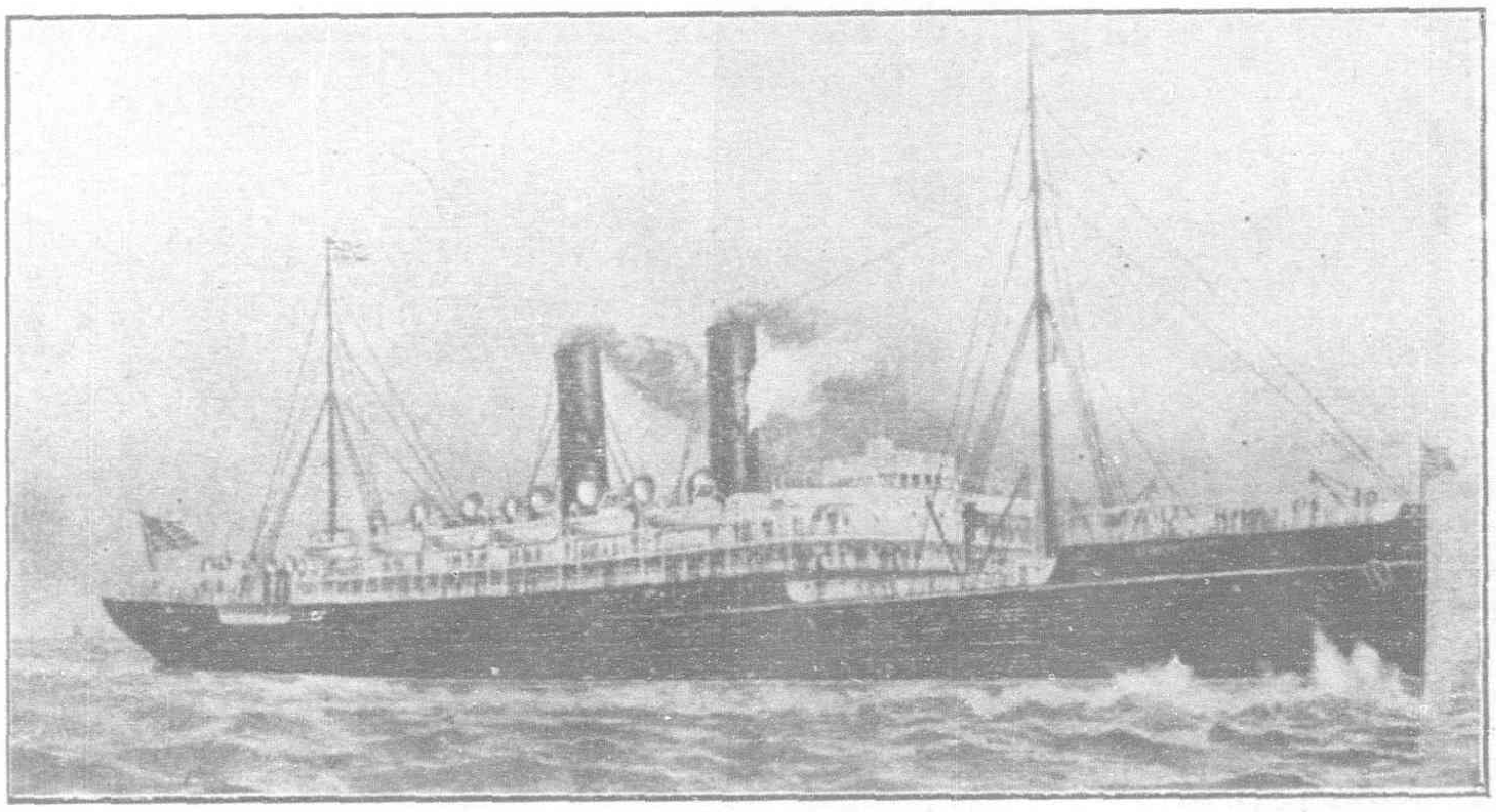
EXAMINATIONS, REPORTS AND SURVEYS OF PHILIPPINE MINES AND MINERAL LANDS

Cable Address: "EVELAND, MANILA"
Codes: Western Union, Bedford, McNeill

THE SEMI-TROPICAL ROUTE
PACIFIC MAIL STEAMSHIP COMPANY
OCCIDENTAL AND ORIENTAL S. S. CO., TOYO KISEN KAISHA
DIRECT SERVICE BETWEEN SAN FRANCISCO AND THE FAR EAST

SAN FRANCISCO
HONOLULU
YOKOHAMA
KOBE
NAGASAKI
SHANGHAI
HONGKONG
MANILA

ALEXANDER CENTER,
GENERAL AGENT;
A. G. D. KERRELL,
GEN PASSENGER AGENT.



MANCHURIA
MONGOLIA
KOREA
SIBERIA
CHINA
DORIC
AMERICA MARU
HONGKONG MARU
NIPPON MARU

GENERAL OFFICE,
MERCHANTSEXCHANGE,
SAN FRANCISCO, CAL

SIBERIA—Transpacific Record 10 days 10 hrs. (Yokohama-San Francisco)

FEATURES OF THE LINE:—Southern route; passengers enjoy outdoors throughout; deck bathing. The call at Honolulu, Oahu, the most fertile and beautiful Island of the Pacific. The only line to San Francisco, the greatest port of the Pacific.

Castle Bros.-Wolf & Sons, Agents, Manila, P. I.

THE MODERN OCCIDENT, THE ANCIENT ORIENT, THE ISLES OF THE PACIFIC, THE HOLY LAND AND ITS MEMORIES, EGYPT AND TS MYSTERIES, AS WELL AS CONTINENTAL EUROPE AND SOUTH AMERICA, ARE ALL EMBRACED IN THE WORLD CIRCLE ITINERARY OF THE ORIENTAL STEAMSHIP COMPANY : : : : : : : :

TOYO KISEN KAISHA
ORIENTAL STEAMSHIP COMPANY

Direct Service Between South America and the Far East per S. S. "Glenfarg"

AGENCIES:
HONGKONG, York Building;
KOBE, 56 Naniwa-Machi;
CALLAO, W. R. Grace & Co
IGUIGUE, W. R. Grace & Co.

HEAD OFFICES:— Kaigan-Dori
YOKOHAMA

Cable Address:
"TOYOASANO'

HONGKONG-SAN FRANCISCO LINE

S. S. "Nippon-maru"
S. S. "America-maru"
S. S. "Hongkong-maru'

AGENCIES:
MANILA, Castle Bros.-Wolf & Sons, 18-28 Plaza del P. Moraga
SAN FRANCISCO, Merchant's Exchange

REPRESENTATIVES AT ALL OTHER PORTS OF CALL AND PRINCIPAL CITIES OF THE WORLD : : : : : : : :
AMERICA, HAWAII, JAPAN, CHINA, PHILIPPINE ISLANDS, INDIA, ARABIA, EGYPT, EUROPE AND SOUTH AMERICA : : : : : : : : : : : : : :

MOUNT FUJIYAMA, which is 12,365 feet high, and is snow-capped the year round, all can be seen from up and down trains for several hundred miles.—A 5-mile ride to the West of Gotemba Station on the Tokaido Line brings you to the base, whence the ascent is about 20 miles.—July and August are the best months to make the ascent.—Lake Biwa is also viewed from the railway for several hours.

IMPERIAL JAPANESE
GOVERNMENT RAILWAYS
OPERATE
EXPRESS AND LOCAL TRAINS
BETWEEN

YOKOHAMA—(The Principal Port of Japan)
TOKYO—(The Capital of Japan)
KYOTO—(The most beautiful and interesting city in Japan)
OZAKA—(The leading Commercial and Manufacturing city of Japan and the Far East)

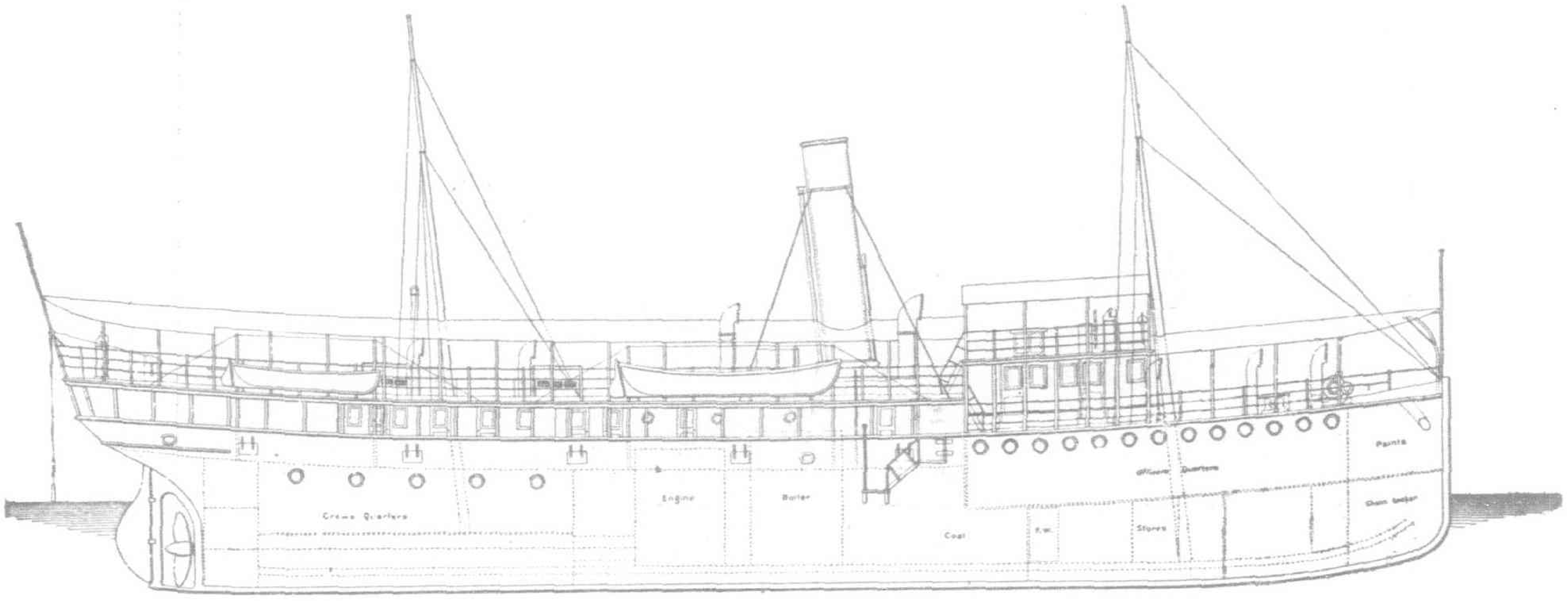
THESE TRAINS HAVE THE MOST LUXURIOUS OF COACHES, SLEEPING AND DINING CARS

Mr. H. Naito, Traffic Manager

Hongkong & Whampoa Dock Co., Ltd.

ENGINEERS, BOILERMAKERS, FOUNDERS, SHIP BUILDERS AND DOCK OWNERS

...HONGKONG...



U. S. COAST & GEODETIC SURVEY STEAMER "FATHOMER" BUILT BY THE HONGKONG AND WHAMPOA DOCK CO., LTD., FOR THE UNITED STATES GOVERNMENT, FOR SERVICE IN THE PHILIPPINES

THE COMPANY'S DOCKS at KOWLOON, TAI-KOK-TSUI and ABERDEEN are in efficient working order, and the attention of Captains and Shipowners is respectfully solicited to the advantages which these Establishments offer for Docking and Repairing Vessels.

The Company has SIX GRANITE DOCKS and TWO PATENT SLIPS of the following dimensions:—

NAME OF DOCK OR SLIP	LENGTH ON KEEL BLOCKS	BREADTH AT ENTRANCE	DEPTH OVER SILL AT ORDINARY SPRING TIDES	RISE OF TIDE	
				SPRINGS	NEAPS
KOWLOON	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
No. 1 Dock, Kowloon	576	86 feet top 70 ft. bottom	30′	7′ 6″	3
No. 2 Dock, Kowloon	371	74′	18′ 6″	7′ 6″	—
No. 3 Dock, Kowloon	264	49′ 3″	14′	7′ 6″	—
Patent Slip, No. 1, Kowloon	240	60′	14′	7′ 6″	—
Patent Slip, No. 2, Kowloon	220	60′	12′	7′ 6″	—
TAI-KOK-TSUI					
Cosmopolitan Dock	466	85′ 6″	20′	7′ 6″	—
ABERDEEN					
Hope Dock	430	84′	23′	7′ 6″	—
Lamont Dock	333	64′	16′	7′ 6″	—

The DOCKS are fitted with every appliance in the way of Caissons powerful Centrifugal Steam Pumps, etc., which enable them to be pumped out in three hours.

WORKSHOPS.—The extensive workshops on the premises at Kowloon, Cosmopolitan, and Aberdeen Docks possess every facility and appliance necessary for the repairs of ships and steam machinery. The Engineers' Shops are supplied with a large plant of the latest types of tools in the way of Lathes, Planing, Milling and Screwing Machines, Electric Cranes, etc., etc., and capable of executing the largest class of work with despatch. The Shipwrights' Department has attached to it a Steam-Sawmill with Circular, Vertical and Band Saws, and also a complete plant of Wood-working Machinery of the most modern and improved type. The Blacksmiths' Shops are equally well furnished with a complete supply of powerful Steam Hammers, Cranes, etc., capable of forging stern posts and crank and straight shafting of the largest size.

Powerful Lifting Shears with steam purchase at two of their Establishments stand on a solid granite seawall, alongside which vessels can lie drawing 24 feet of water, and take in or out boilers, etc. The Shears at Kowloon are capable of lifting 70 tons.

The Company is prepared to tender for the construction of new vessels in either steel, iron or wood, having already built about 400 of varying sizes up to 3,000 tons; also to execute all kinds of ship work at lower rates and with greater despatch than any establishment in the East Every department is under the close supervision of experienced European foremen.

SHIP-YARD is fully equipped with modern plant, including hydraulic flanging and bending machines, electrically driven rolls, punching, shearing, angle-bevelling, joggling and planing machines, capable of dealing with the heaviest class of work.

BOILER-MAKERS' DEPARTMENT.—The Company, in addition to executing repairs, is prepared to tender for new boilers to steamships for the construction of which it possesses special facilities, including powerful punching and shearing machines, hydraulic rivetters, etc.

FOUNDRY.—The Foundry is fitted with a large powerful Steam Crane and the Cupolas are capable of casting up to 100 tons. The Company is prepared to supply the very best iron and Brass Castings of all descriptions upon the shortest notice.

GALVANIZING PLANT of the most modern type by electrical deposit has been put up at the Kowloon Establishment, which is capable of doing the largest class of work.

STORES.—The Company's Godowns contain large and well-selected stocks of all material and fittings requisite in shipbuilding, engine-room outfits furnishings, and ships' stores of all descriptions supplied at tariff rates.

For Further Particulars apply at the Offices of the Company, Queen's Buildings, No. 1, New Praya, Hongkong

Telegraphic Address for all the offices:
"MITSUI"

Codes Used:
A. B. C. and AI.

The Mitsui Bussan Kaisha

(MITSUI & CO. IN EUROPE AND AMERICA)

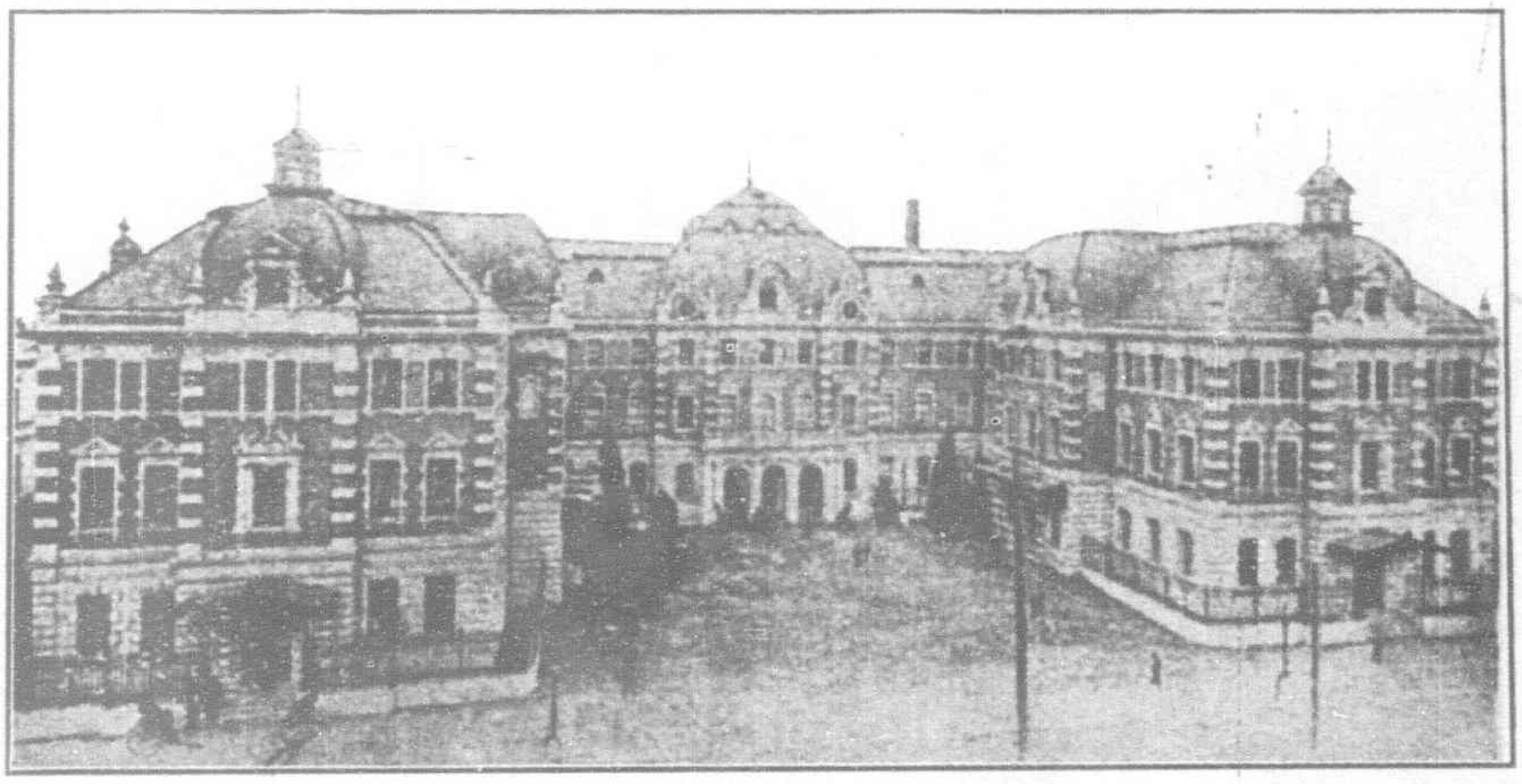
General Importers and Exporters

Head Office:
No. 1 Suruga-cho,
Tokyo

New York Office:
445-447 Broome St.
New York

Manila Agency:
330 General Solano,
San Miguel

Telephone 30



THE MITSUI BUILDING, TOKYO

BRANCH OFFICES

London, San Francisco, Hamburg, Bombay, Singapore, Hongkong, Amoy, Shanghai, Hankow, Chefoo, Tientsin, Newchang, Dalny, Seoul, Chemulpo, Yokohama, Osaka, Kobe, Moji, Karatsu, Nagasaki, Kuchinotsu, Taipeh, Omuta (Muke), Nagoya, Sourabaya, Sydney.

Telegraphic Address:
"GRAND"

Telephone (Long Distance)
No. 85.

The Grand Hotel, Limited

G. L. A. SMITH, Manager

18, 19 and 20 The Bund, Yokohama, Japan

COMMANDS AN UNBROKEN VIEW OF THE HARBOR AND TOKYO BAY FROM BROAD TERRACES WHICH AFFORD A PLEASANT LOUNGE

Electrically Lighted Throughout

Steam Heat and Open Fires

Rooms Single, or En Suite with Private Bath, etc.

RATES FROM 6 YEN UPWARD

NO EXTRAS

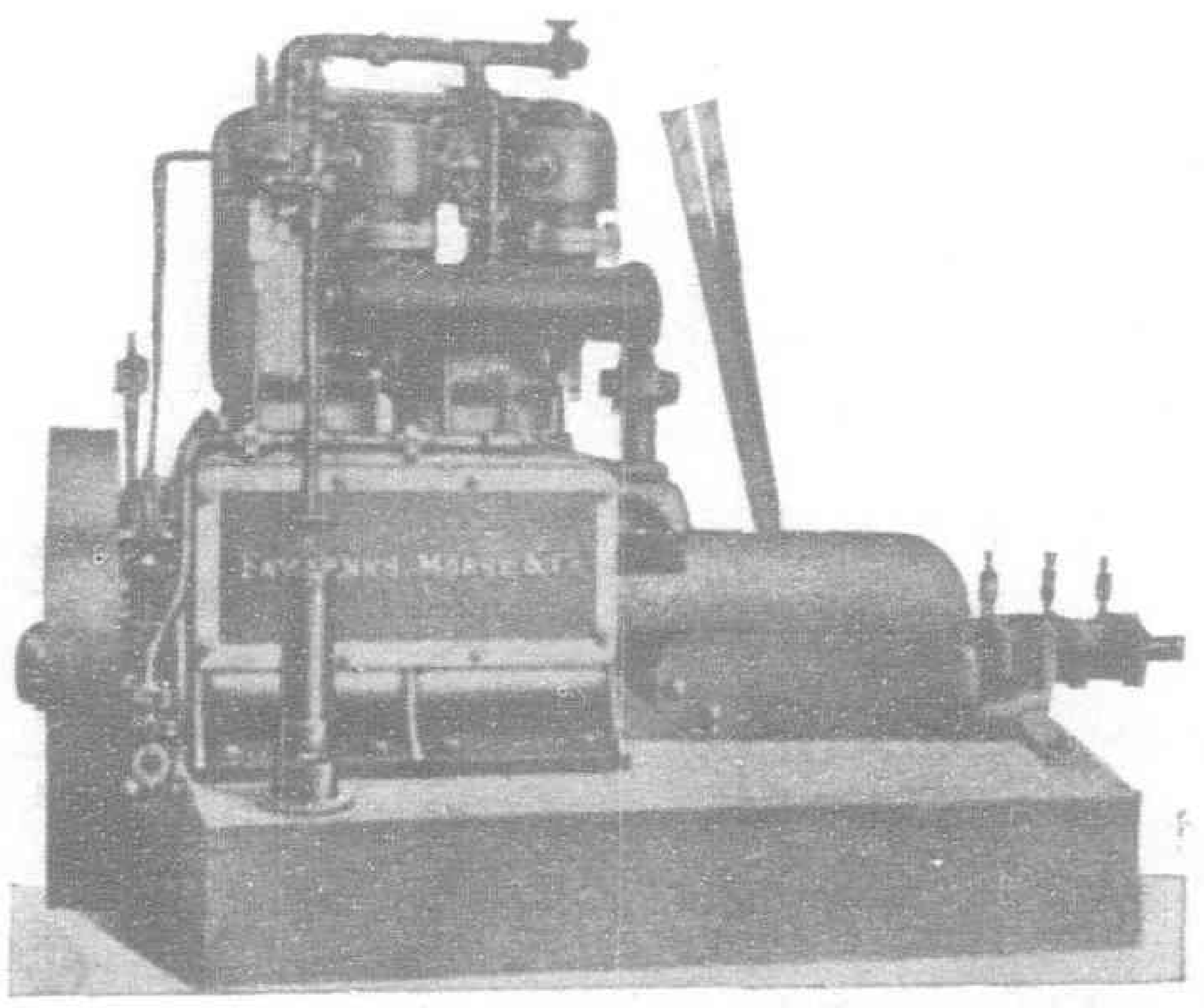
Wines and Cuisine (French Chef) the Best the Market Affords. The Hotel Band Plays Each Evening. A Steam Launch Under Competent Supervision Attends All Arriving and Departing Steamers, and the Porter Attends to All Customs Formalities in Respect to Baggage.

THE GRAND HOTEL CATERS TO FIRST-CLASS TRAVEL AND IS THE BEST KNOWN HOTEL IN THE EAST

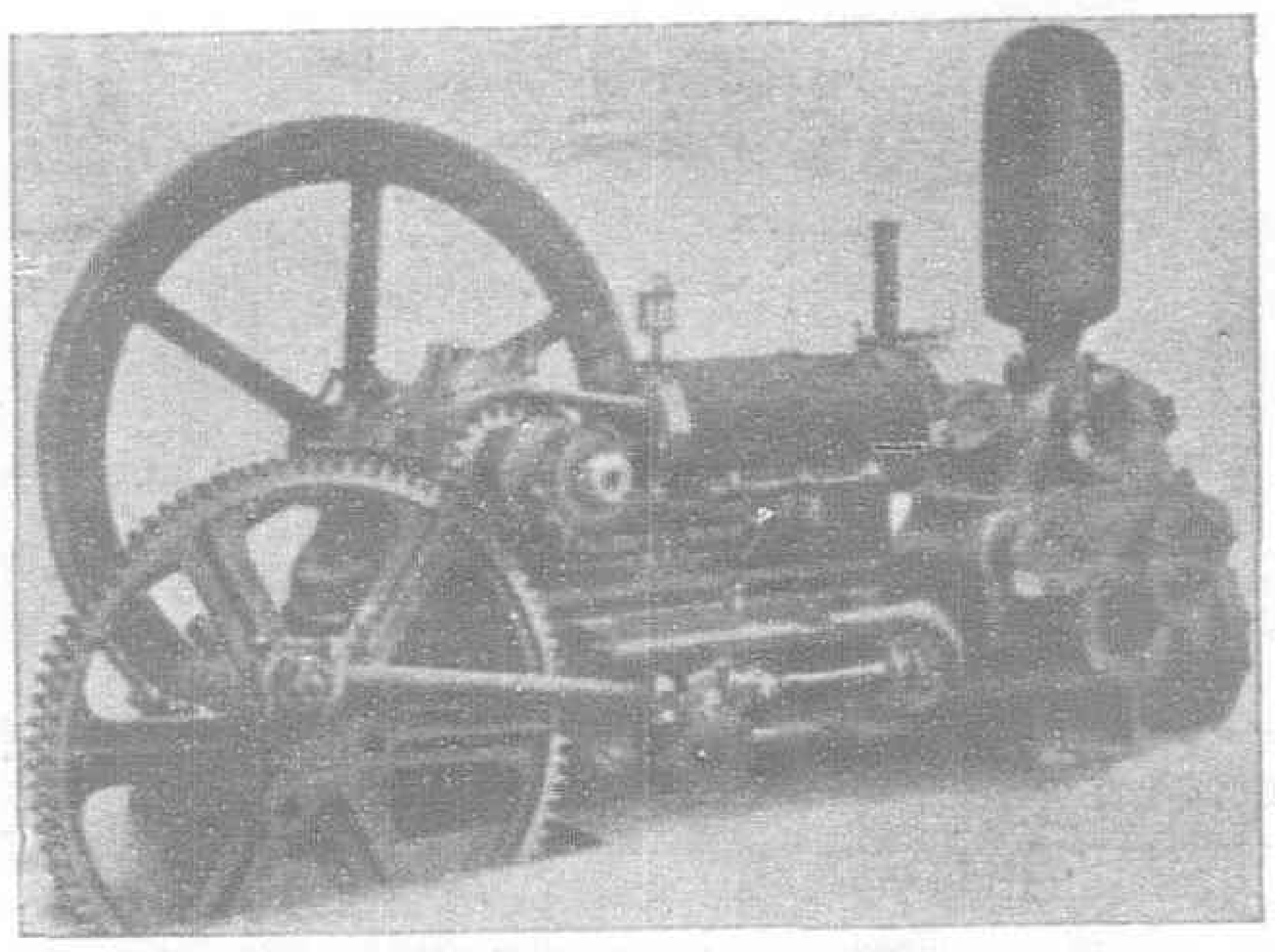
Address Letters to "The Manager"

Fairbanks, Morse & Co.

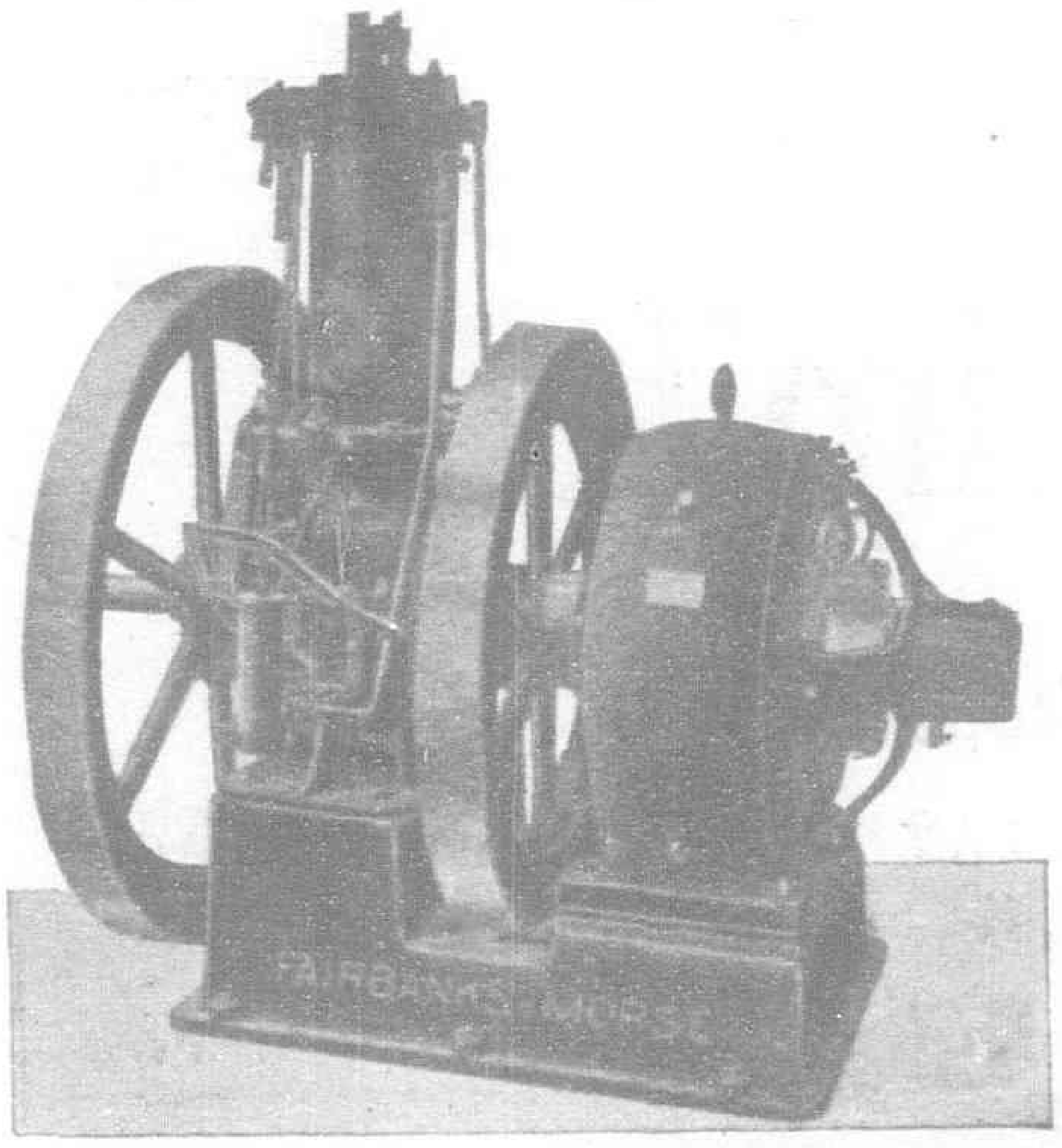
CHICAGO, U. S. A.



MARINE



GAS ENGINE AND PUMP



ELECTRIC PLANT

Gasoline
Distillate

Kerosene
and
Crude Oil
Engines

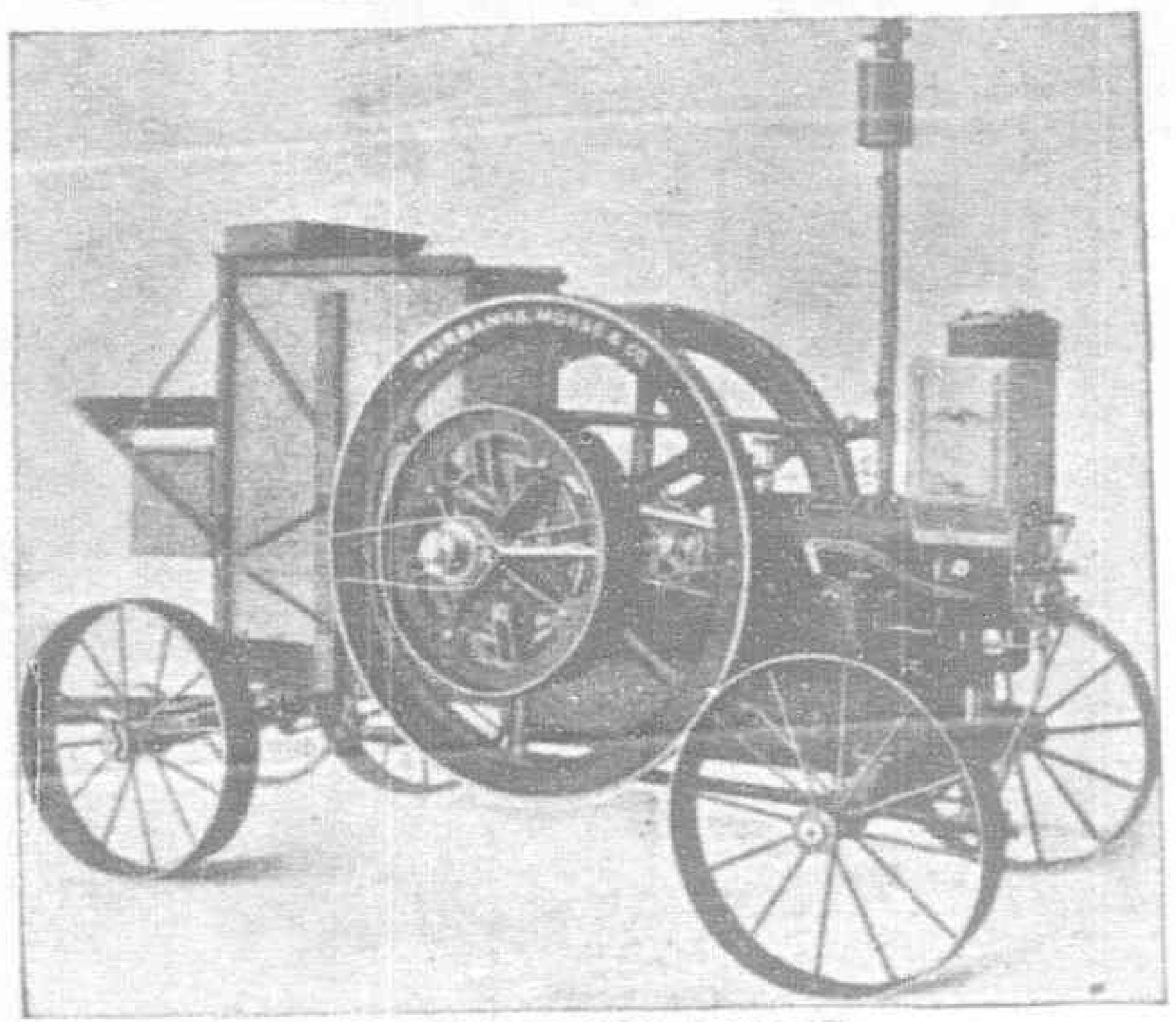
PUMPING MACHINERY

MARINE ENGINES
For Launches
and Steamers

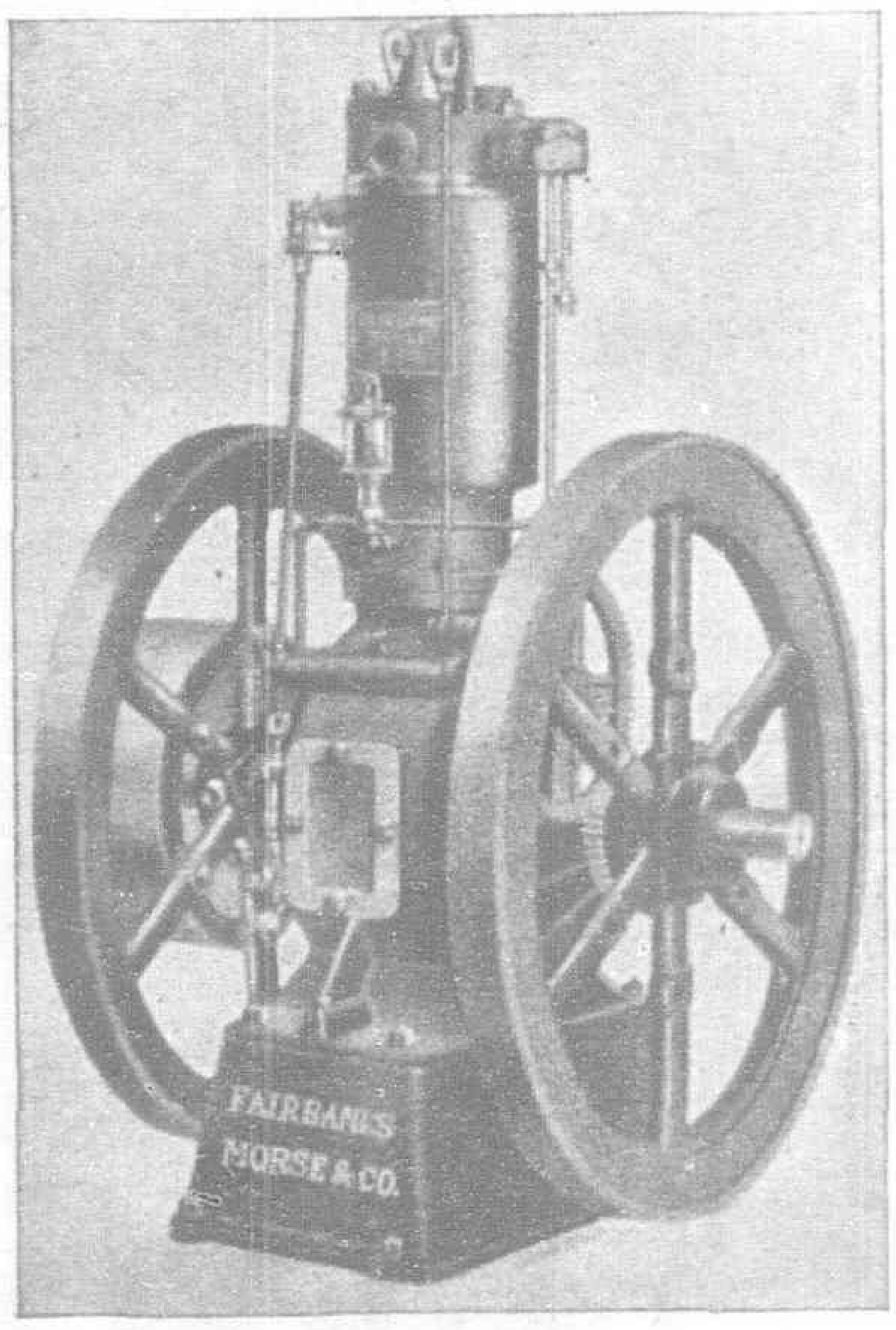
Sole Agents for the Philippines

Castle Bros.-Wolf & Sons

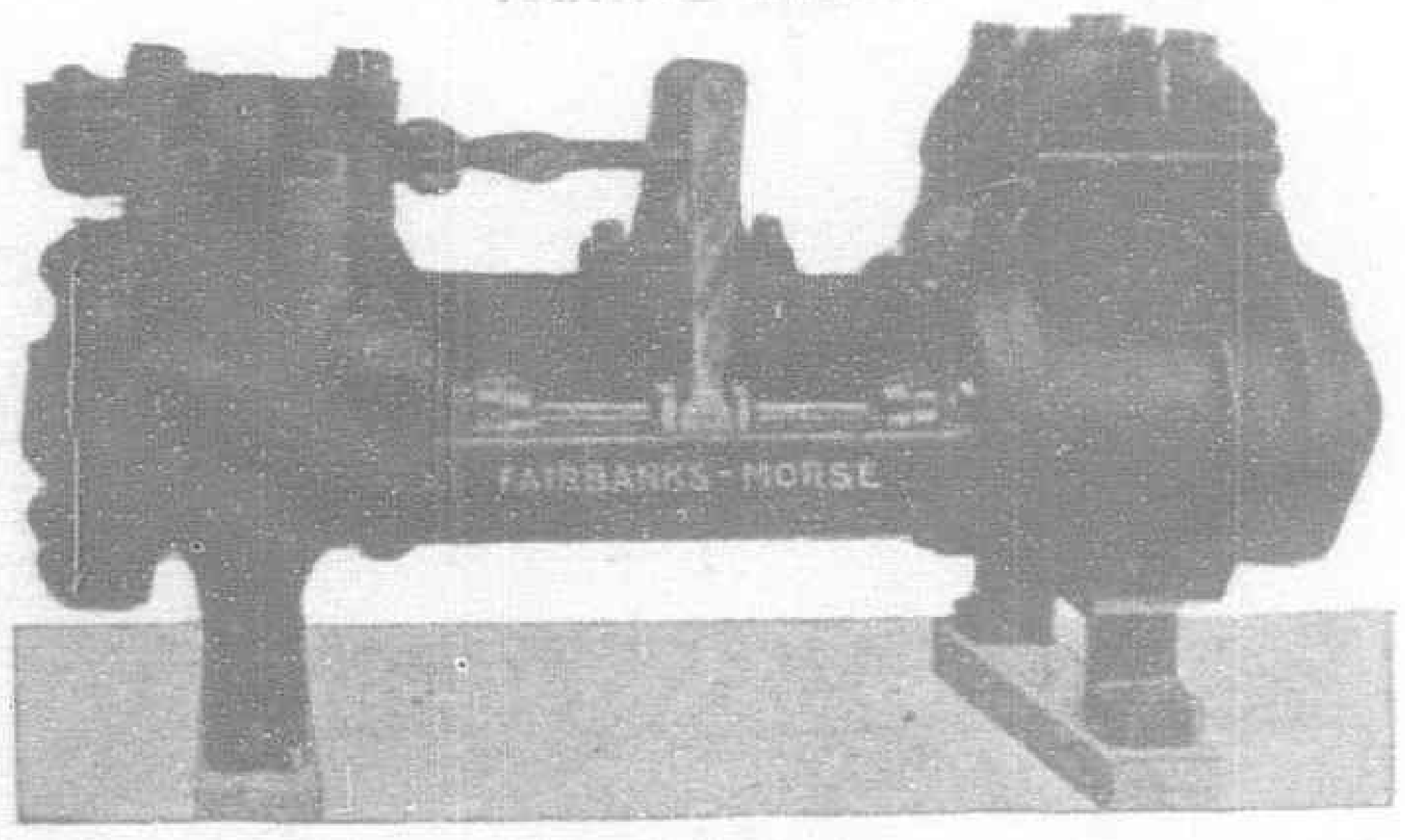
MANILA
Engineering Department



PORTABLE GAS ENGINE

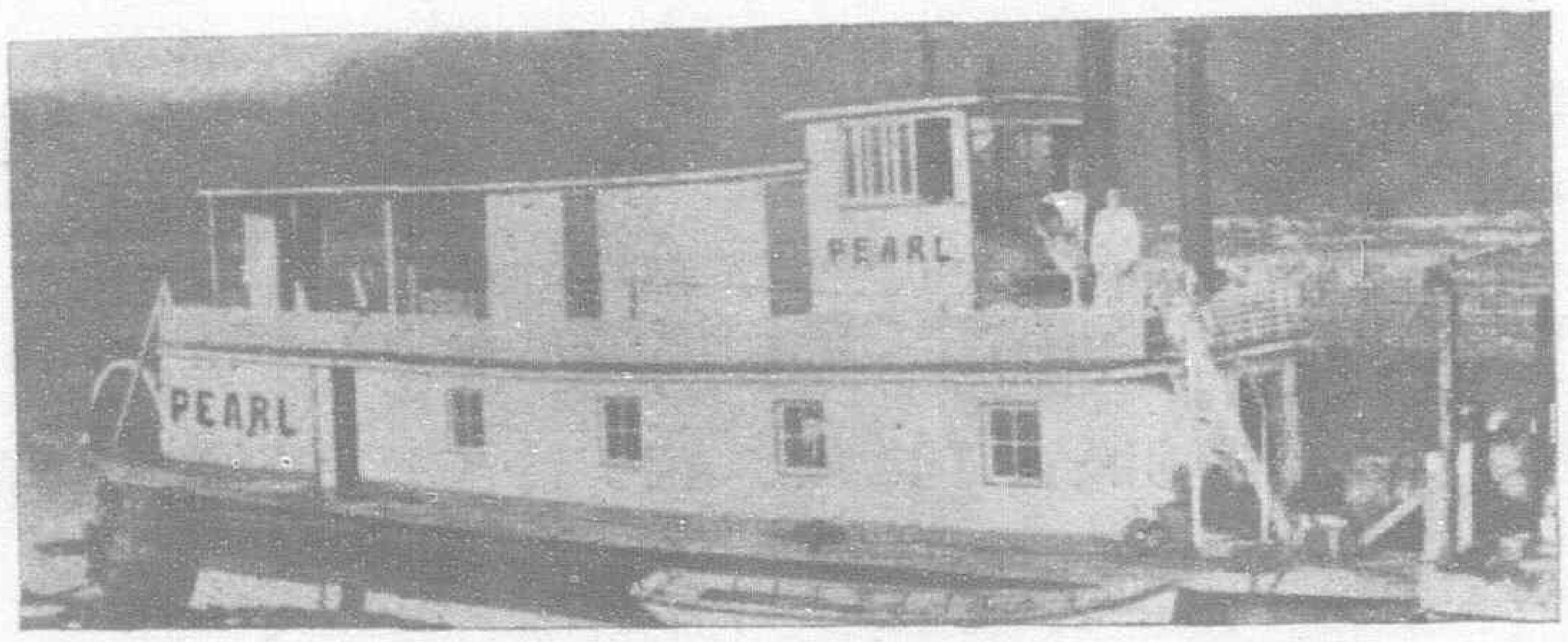


VERTICAL ENGINE



PUMP

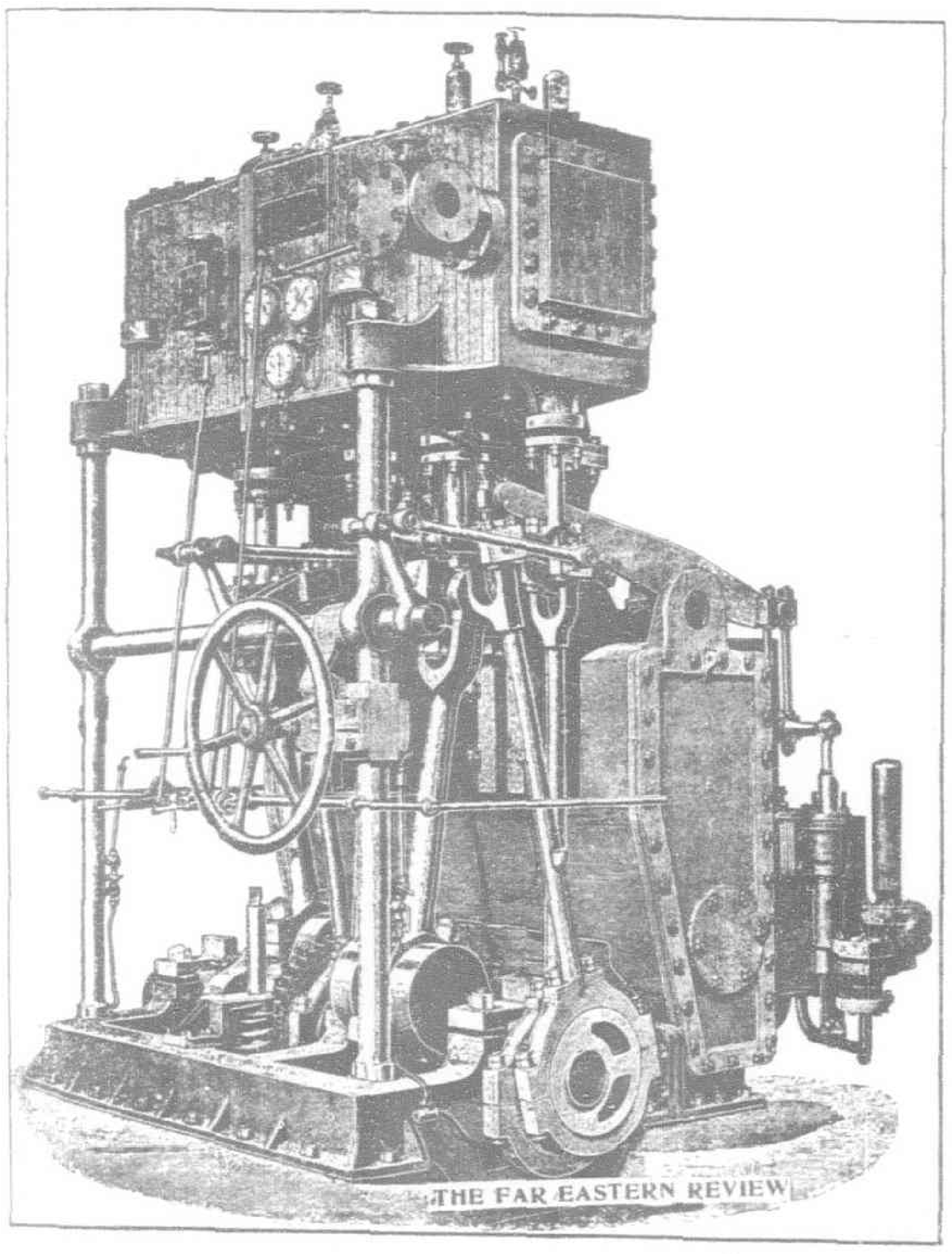
River
Steamers
Equipped



RIVER STEAMER

Complete
Plants

Manuel Earnshaw & Co.



MARINE ENGINEERS, SHIP, BOILER AND ENGINE REPAIRERS, LAUNCH BUILDERS, ETC., MARINE SLIPWAY

ESTIMATES FURNISHED PROMPTLY

THE MANILA FOUNDRY

Large castings made daily of Iron, Brass, etc., with complete and modern machinery; the best of materials used and special alloys prepared under expert supervision

No. 151 Reina Regente St. Meisic, Tondo

PROPRIETORS:

TOMAS EARNSHAW | DANIEL EARNSHAW, JR.
MANUEL EARNSHAW | J. MORENO DOMENECH

Barcelona, No. 15, Binondo, Manila

Telegraphic Address "MEARNSHAW" MANILA | Codes used: A B C, 5th Edition | General Engineering Code and supplement, and private codes

Telephone 213 - - - - - - - - - - - P. O. Box 282

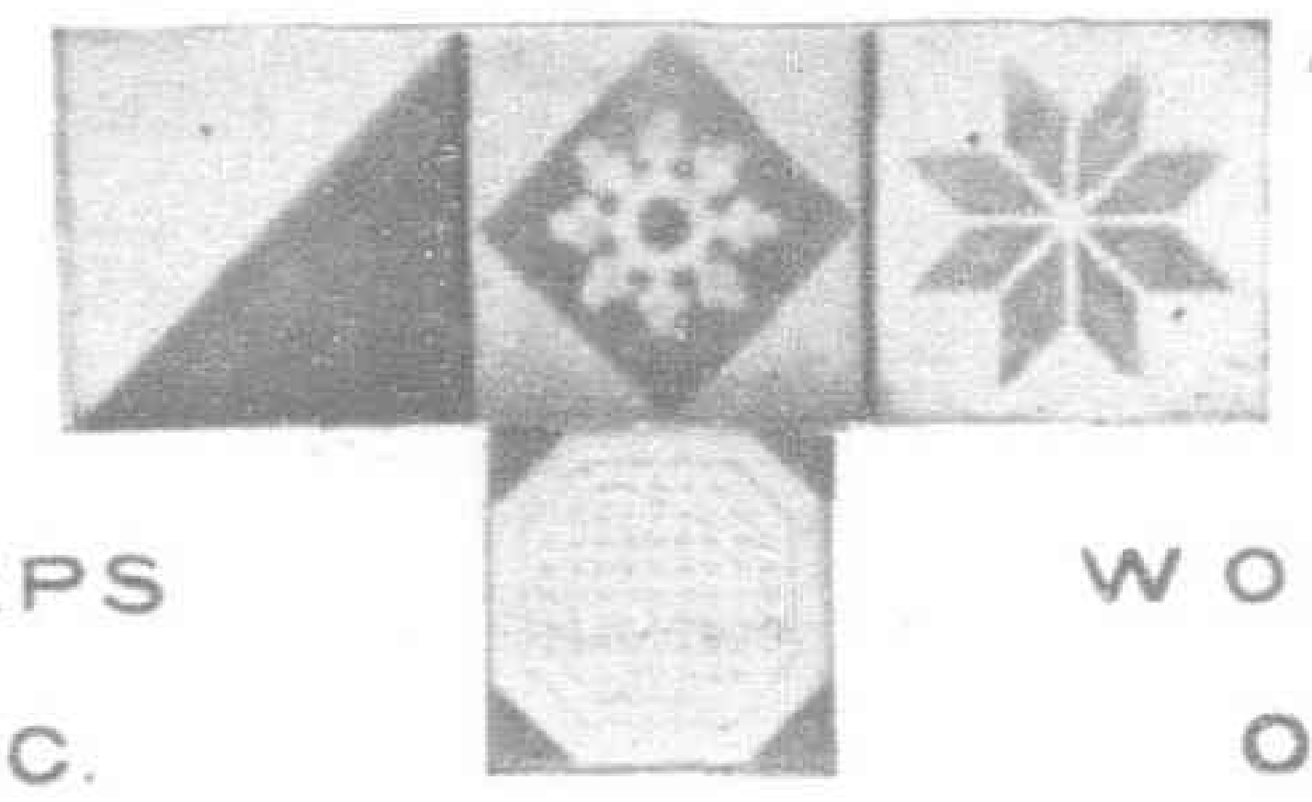
Marine Engines and Boilers of all Sizes

SANTA MESA CEMENT TILE AND PIPE FACTORY

CEMENT SEWER PIPE

IN ANY DIMENSION

IMITATION MARBLE IN TILES, DOORSTEPS ETC., ETC.



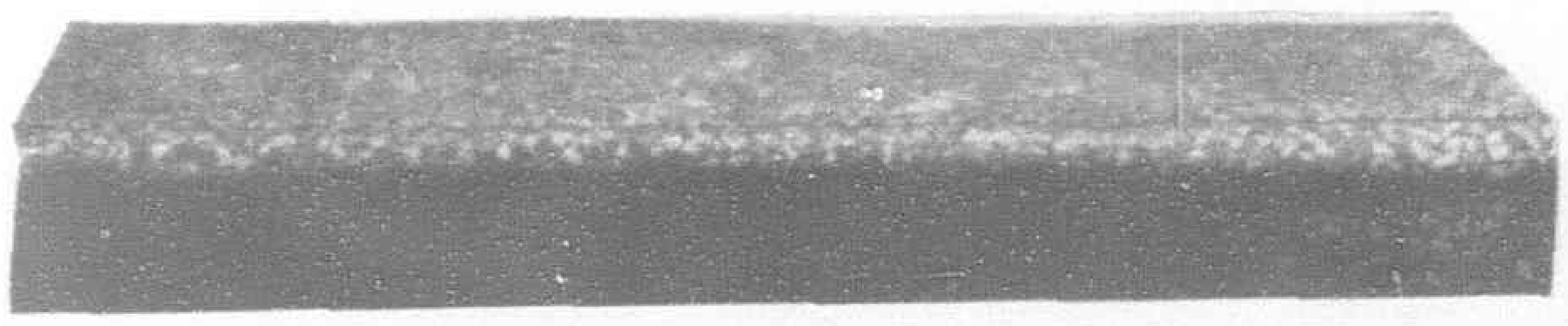
ALL KINDS OF CEMENT WORK TO ORDER

C. FRESSEL & CO.

FOUNDED IN 1886

MANUFACTURERS OF ALL KINDS OF CEMENT TILES, PLAIN AND IN DESIGNS

Special Designs Made to Order

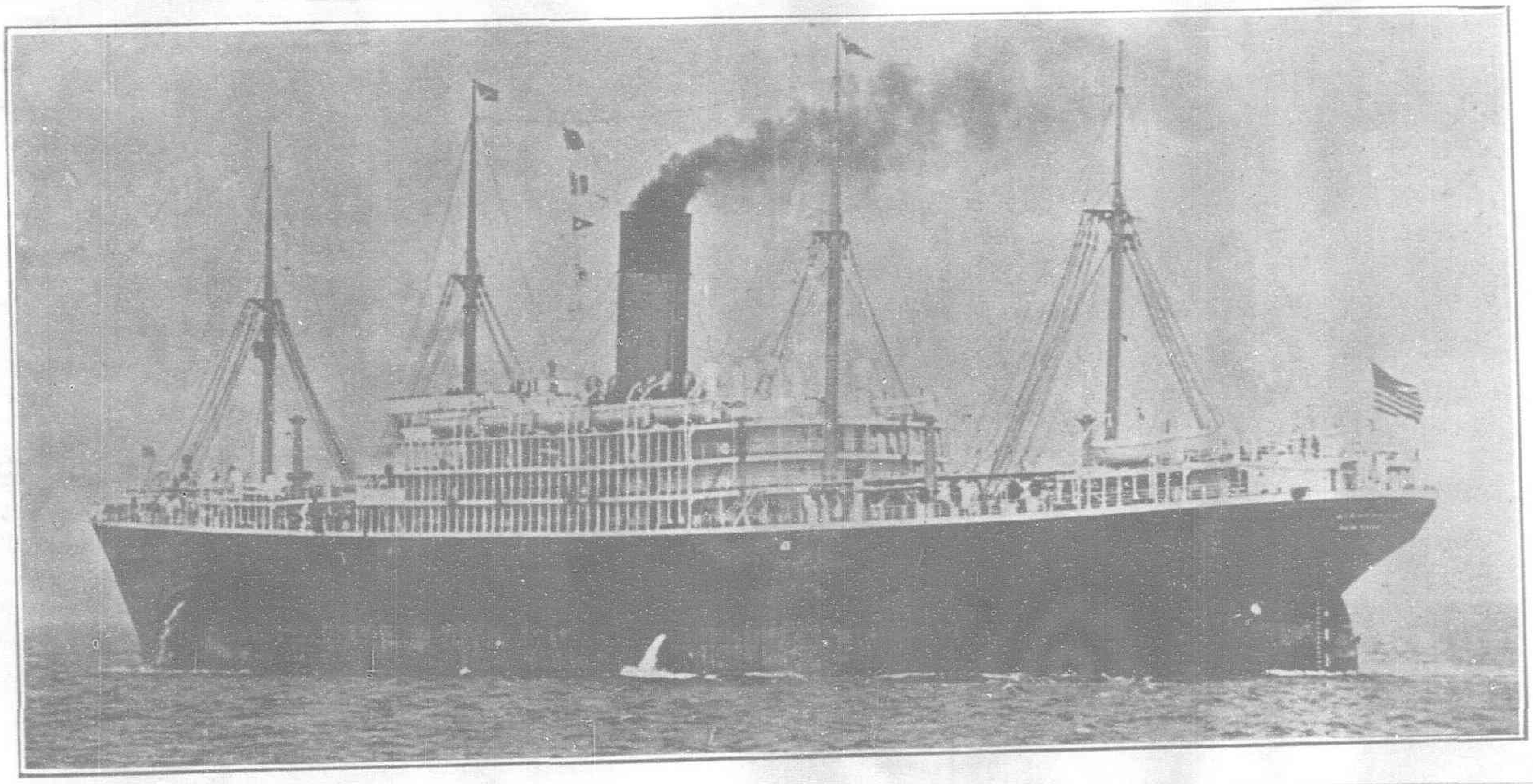


CEMENT GUTTER PIPE

IN ANY DIMENSION

OFFICE 118-122 Calle Nueva, Binondo—MANILA, P. I.

Shortest and most Comfortable Route to the United States



Great Northern Steamship Company

OPERATING NEW TWIN SCREW STEAMSHIPS

MINNESOTA AND DAKOTA

Length 630 feet, Beam 72.6, Depth of Hold 56 feet.

These magnificent vessels, of 28,000 tons capacity each, have luxurious passenger accommodation being unequalled by any vessel on the Pacific and unexcelled on the Atlantic.

PASSENGERS FROM MANILA to Trans-Pacific points have the choice of any of the local steamers to Hongkong without extra cost, the same rates applying from Manila as from Hongkong and Shanghai.

A WEEK IN JAPAN may be enjoyed by such passengers leaving the "Minnesota" or "Dakota" at Nagasaki, and travelling by rail at *Company's expense* to Yokohama, joining the steamer again at that port.

SPECIAL RATES are allowed members of the United States Army and Navy; Missionaries, and to Employees of the Insular Government of the Philippines.

VOYAGE ACROSS THE PACIFIC of less than fifteen days is one continuous series of delightful pleasures. No expense has been spared to afford passengers every conceivable comfort during a voyage where various changes of temperature are met.

SCHEDULE OF SAILINGS

FROM SEATTLE						STEAMER	VOYAGE	TO SEATTLE					
LEAVE	ARRIVE							LEAVE					ARRIVE
SEATTLE	YOKOHAMA	KOBE	NAGASAKI	SHANGHAI	HONGKONG			HONGKONG	SHANGHAI	NAGASAKI	KOBE	YOKOHAMA	SEATTLE
Sept. 2	Sept. 18	Sept. 24	Sept. 30	Oct. 3	Oct. 8	. . DAKOTA . .	5	Oct. 16	Oct. 20	Oct. 23	Oct. 26	Oct. 29	Nov. 13
Oct 20	Nov. 5	Nov. 11	Nov. 17	Nov. 20	Nov. 25	. MINNESOTA .	8	Dec. 3	Dec. 7	Dec 10	Dec. 13	Dec. 16	Dec. 31
Nov. 28	Dec. 14	Dec. 20	Dec. 26	Dec. 29	Jan. 3	. . DAKOTA . .	6	Jan. 11-07	Jan. 15	Jan. 18	Jan. 21	Jan. 24	Feb. 8

W. W. King, General Passenger Agent, Seattle

Warner, Barnes & Co., Ltd., Manila, P. I.

Nippon Yusen Kaisha, Agents at Hongkong, Shanghai, Nagasaki, Kobe and Yokohama